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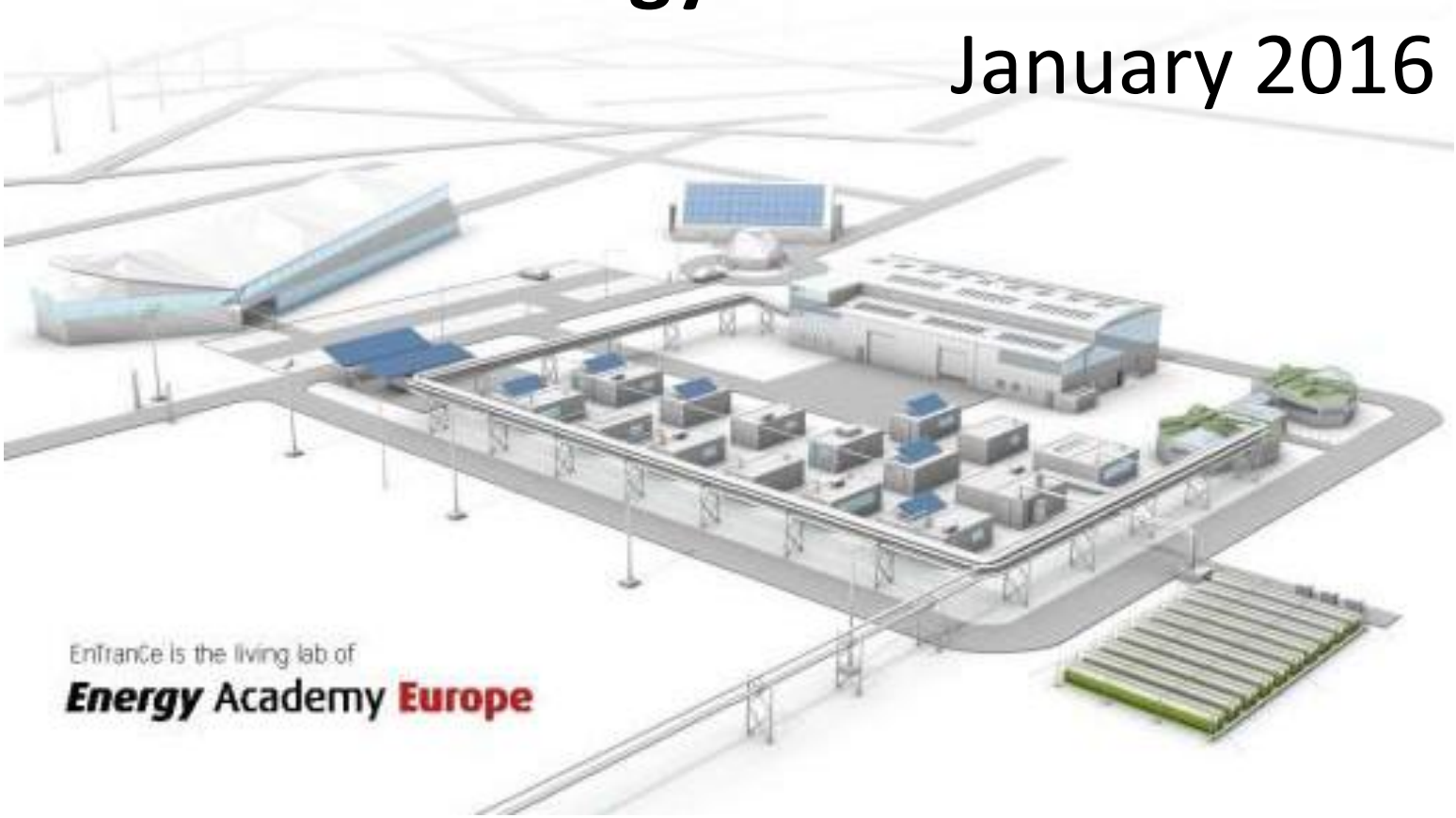
Renewable Energy in The Netherlands
January 2016



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This analyses contains information of various sources and own analyses, including various estimates.

Readers are encouraged to add, to improve the quality of the information provided.

January 2016

In a Nutshell

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- The fraction renewable power was 13.1%., 2% higher than last year
- Renewable power varied between 4.2% (on January 22nd) and 22.9% on January 29th)
- The fraction renewable energy was 5.0%, about 0.4% higher than last year
- Electricity production by wind was 30% higher y-o-y and reached 1.0 TWh.
- Average utilization of wind capacity was 41% and of solar-PV, it was 2%
- CO2 emissions decreased by 3% y-o-y, due to higher ambient temperatures

- NEW: Energy demand and CO2 emissions have been allocated to four main processes: low temperature heat, high temperature heat, transportation and the power sector

Content

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- January 2016 data
- Monthly profiles
- Monthly data
- Hourly data
- Miscellaneous

SELECTED ENERGY DATA FROM JANUARY 2016

Final Energy Demand

January 2016

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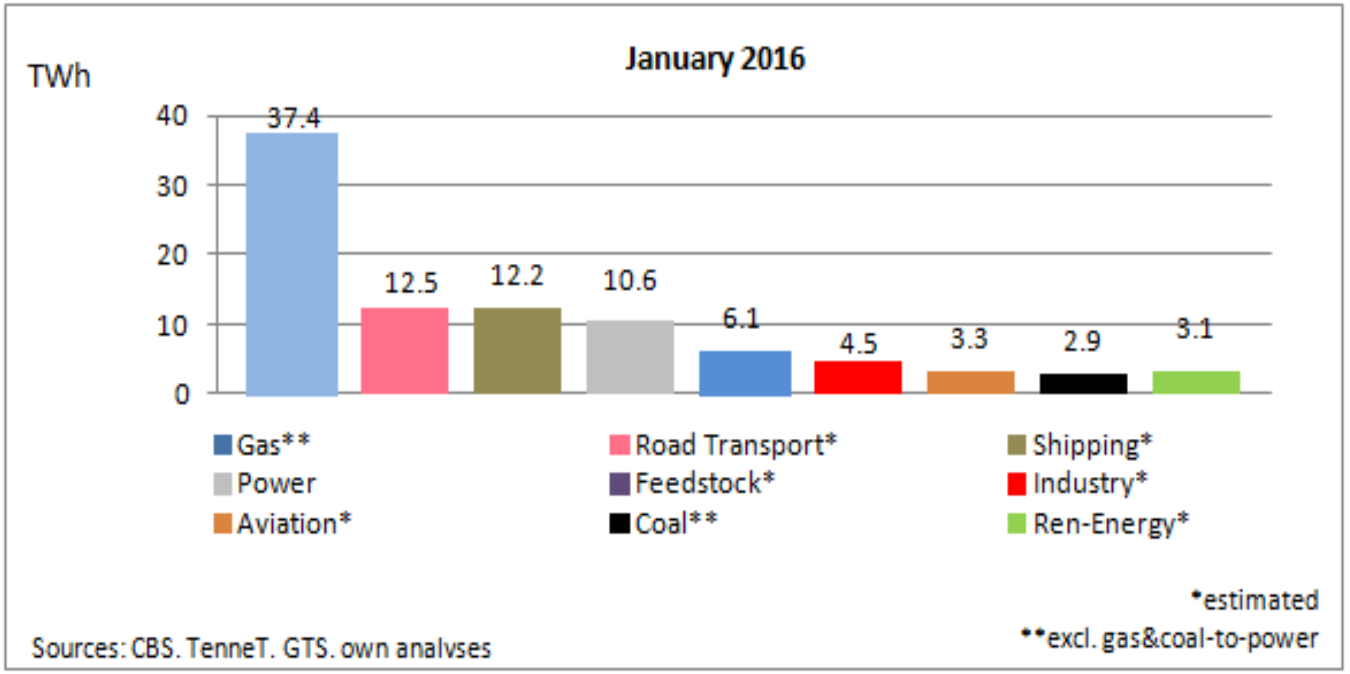

Energy is used for many different purposes. In January 2016, the most important energy applications were gas and various forms of transport.

Final Energy Demand January 2016 (vs 2014)

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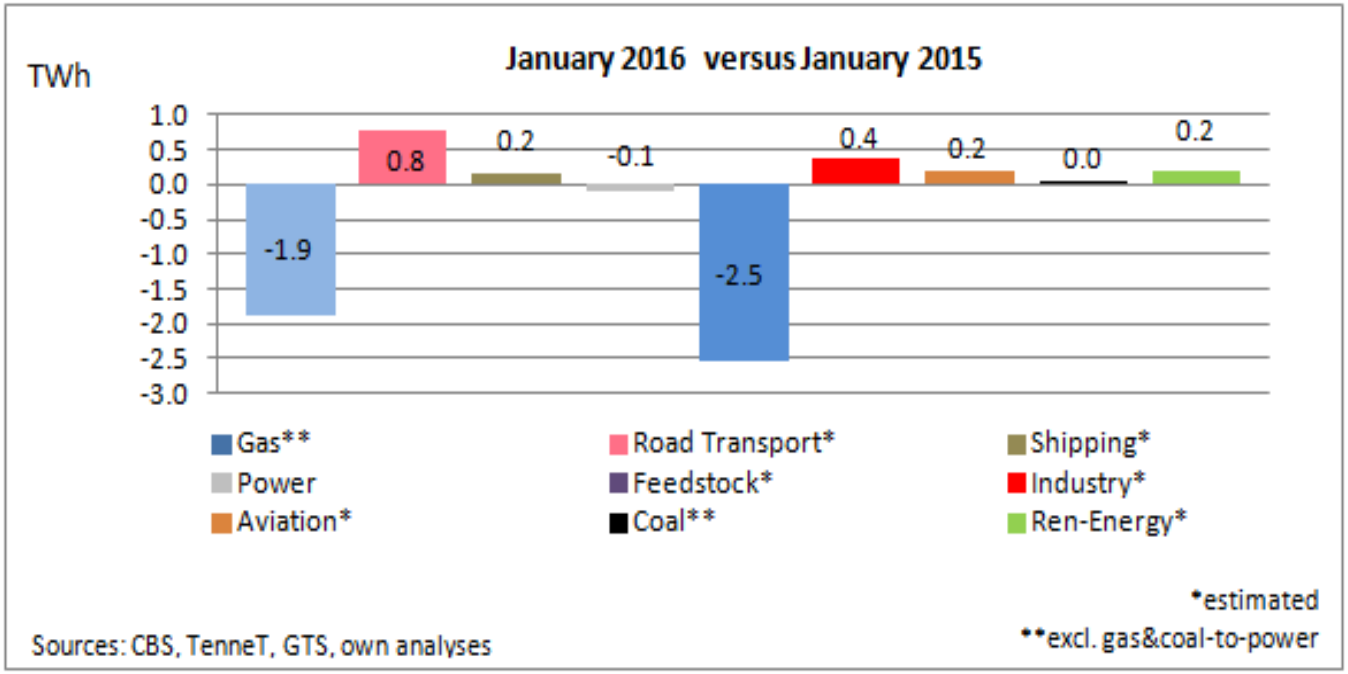

In January 2016, gas demand significantly lower than last year, due to much higher ambient temperatures. Energy usage for feedstock is estimated to be significantly lower as well.

CO2 Emissions

January 2016

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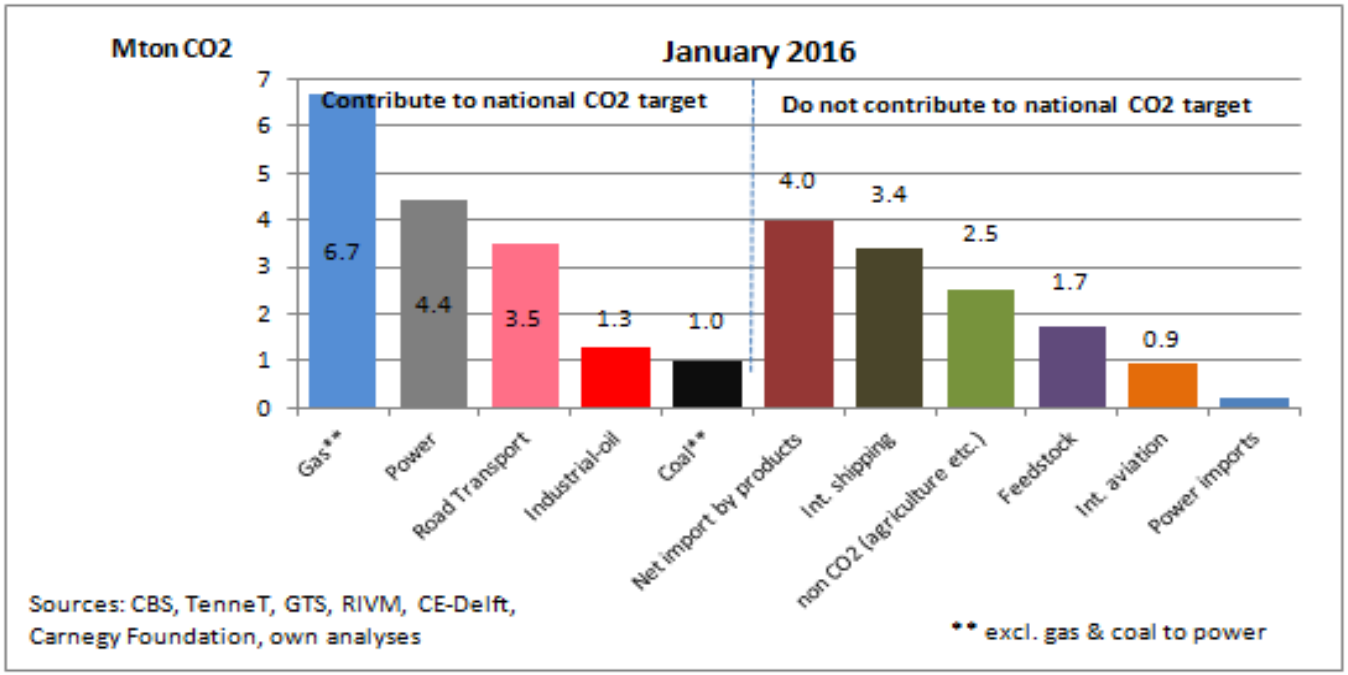

In January, the national energy-related CO2 emissions are estimated at 16.9 Mton, down from 17.3 Mton in January 2015. This decrease is mainly due to much higher ambient temperatures. The total Dutch CO2 footprint, including the CO2 sources that are caused by The Netherlands, but do not contribute to the official CO2 emissions, are estimated at nearly 30 Mton.

Power Generation Capacity January 2016

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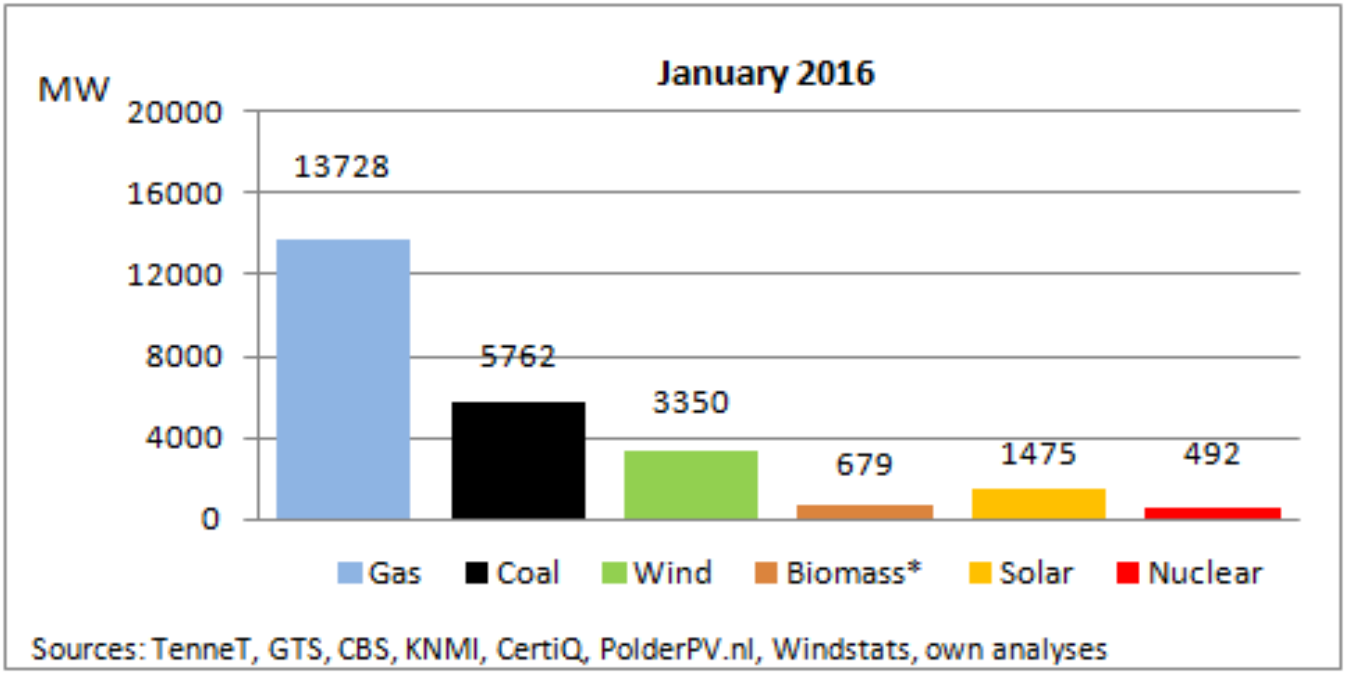

The capacity (beginning of January) is the so-called name-plate capacity. In practice, not all capacity is available for the market due to planned and unplanned maintenance. Just before Christmas, two coal-fired stations (Nijmegen and Amer 8) with a total capacity of about 1200 MW were was definitely closed.

Power Supplies

January 2016

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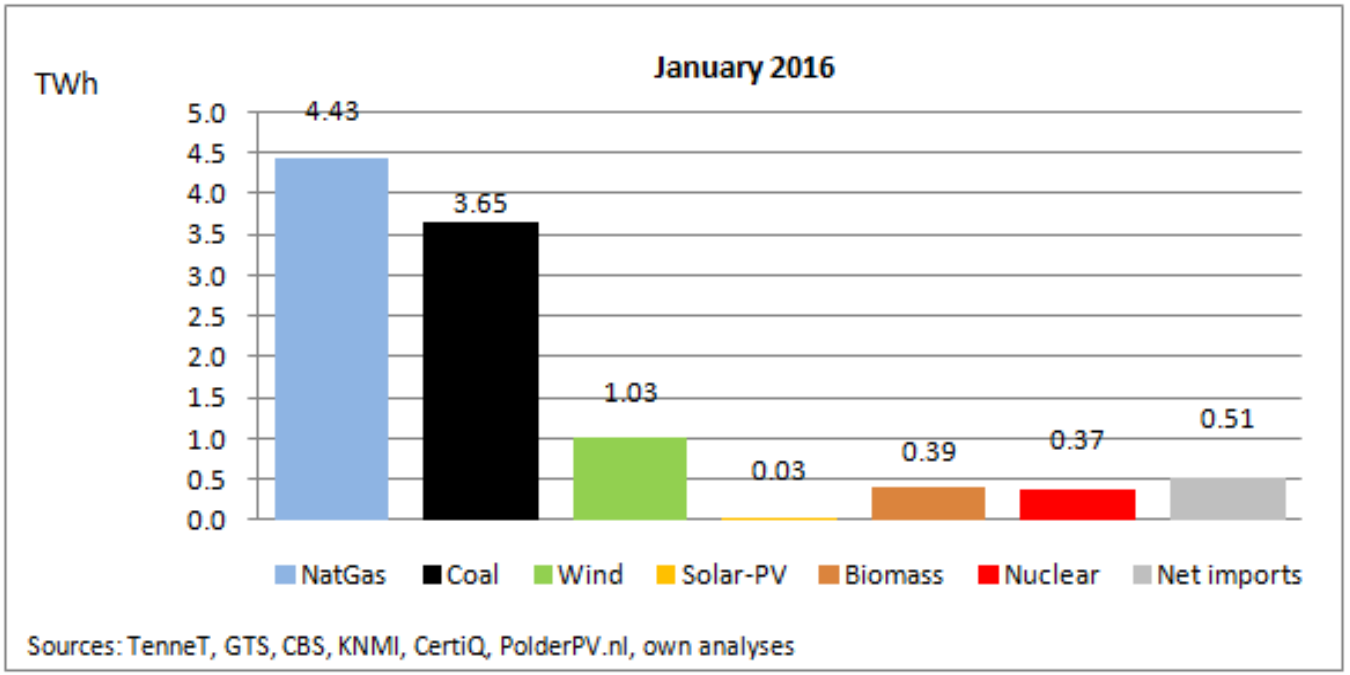
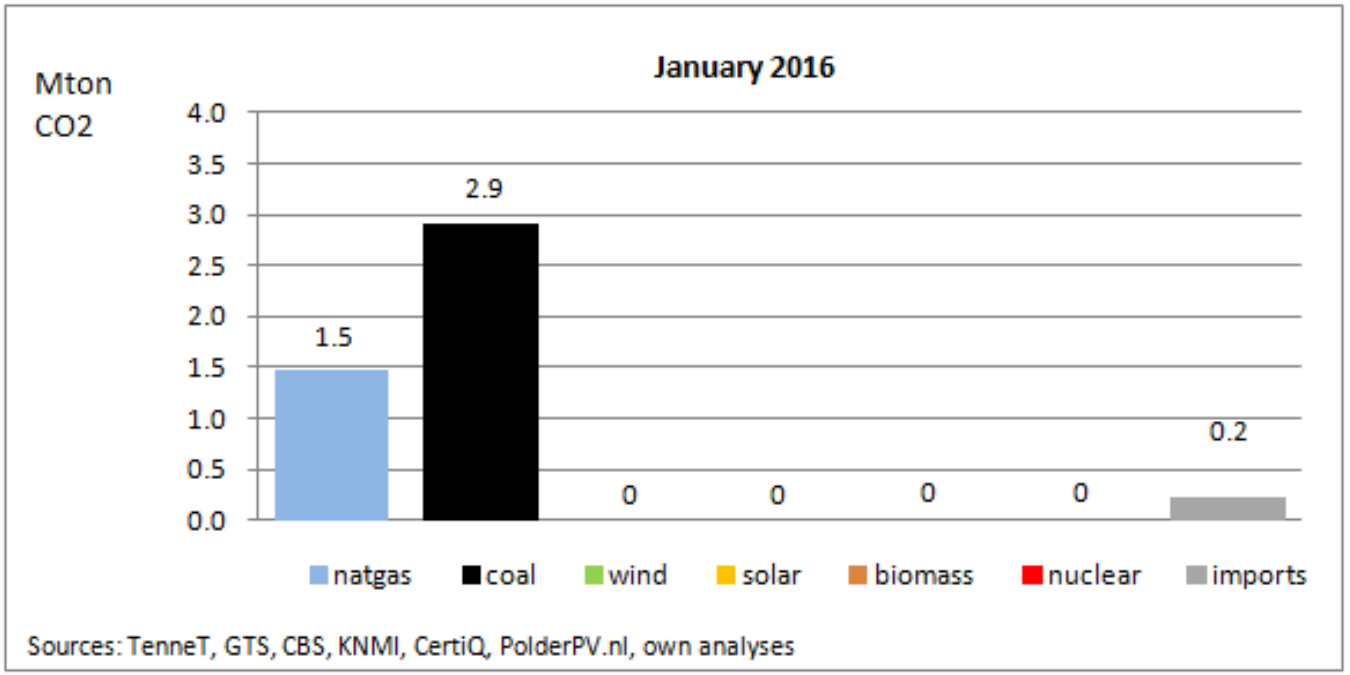


In January 2016, power consumption was 10.6 TWh, 1% lower than last year. In January 2016, there was high availability of wind and renewables accounted for 13% in the power system, up from 11% January 2015.

CO2 from Power Generation

January 2016



. In January 2016, 75% of the CO2 emissions from the power sector came from the coal-fired power stations. The CO2 emissions from imports are given for comparison, since these do not contribute to the National Dutch CO2 emission level

SELECTED MONTHLY PROFILES

(using daily data)

Gas and Power Demand January 2016

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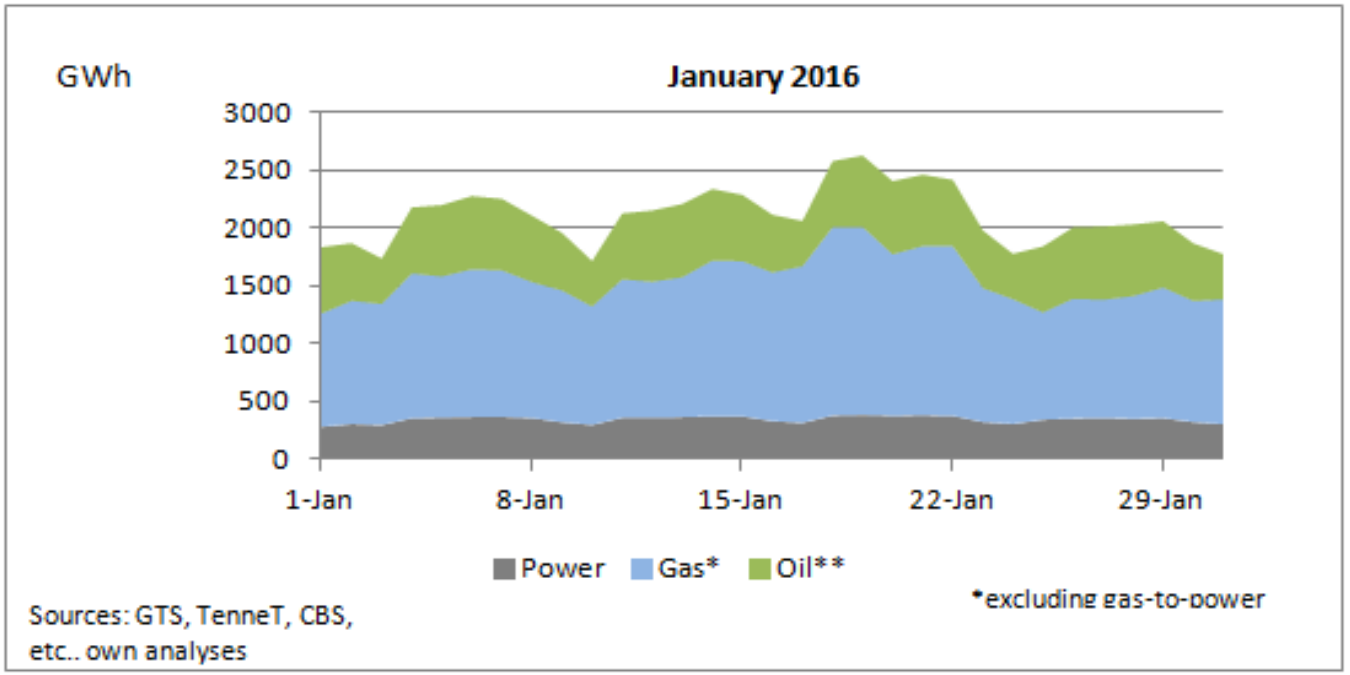

Daily power demand shows a week-weekend pattern. Daily gas demand is mainly determined by ambient air temperature. Oil demand for road transport varies between weekdays and weekends.

Conventional Power Production January 2016

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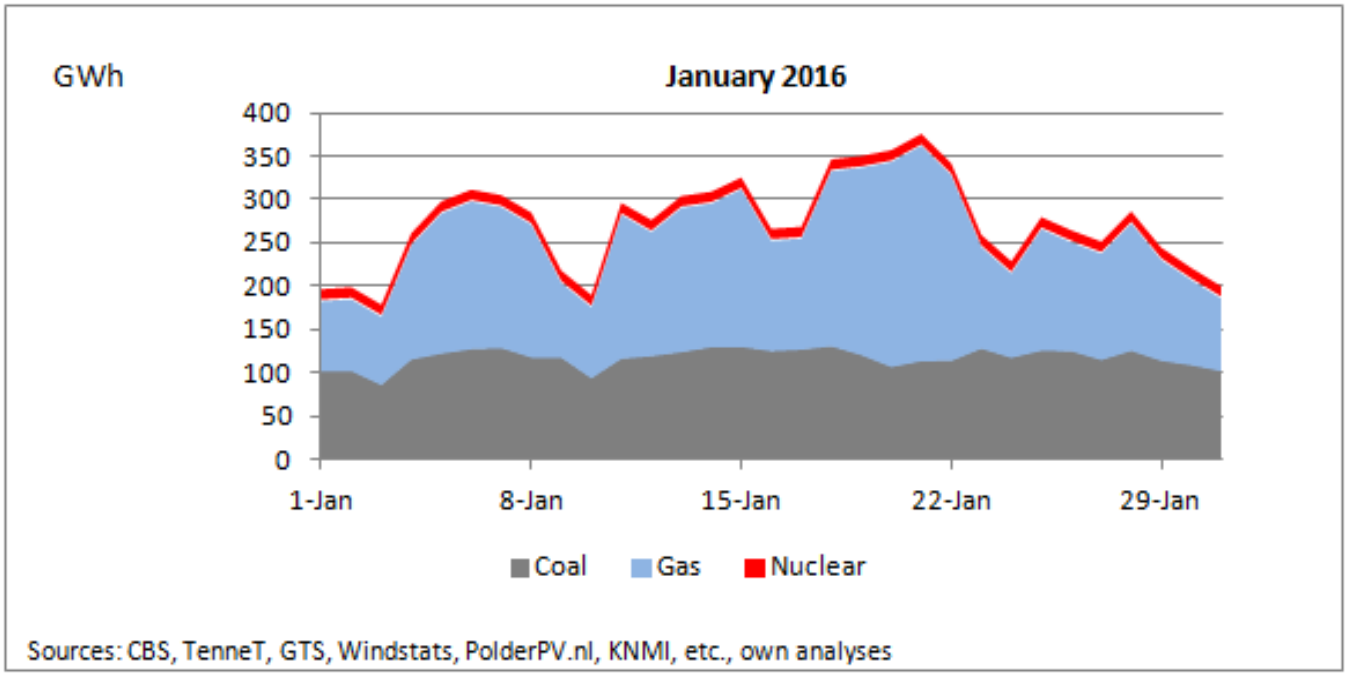

The week-weekend pattern of the coal-fired power stations is less pronounced then last year, due to the closure of some coal-fired capacity. Gas-fired generation is either must-run capacity or necessary to balance the system.

Wind and Solar Power Production January 2016

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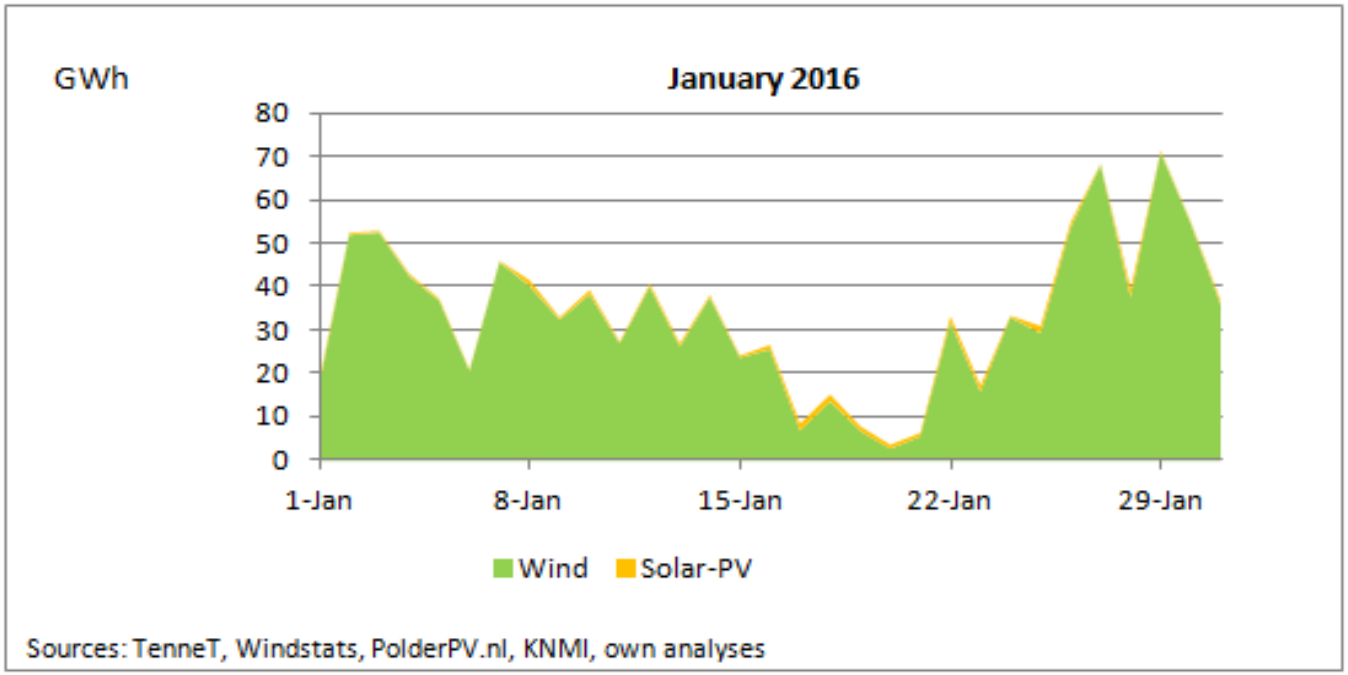

January 2016 was rather windy and wind generation exceeded 1 TWh. On the other hand, in winter, solar-PV electricity production is rather low.

1 GWh is sufficient to provide power for a year to 300 households.

Contribution of Renewable Energy January 2016

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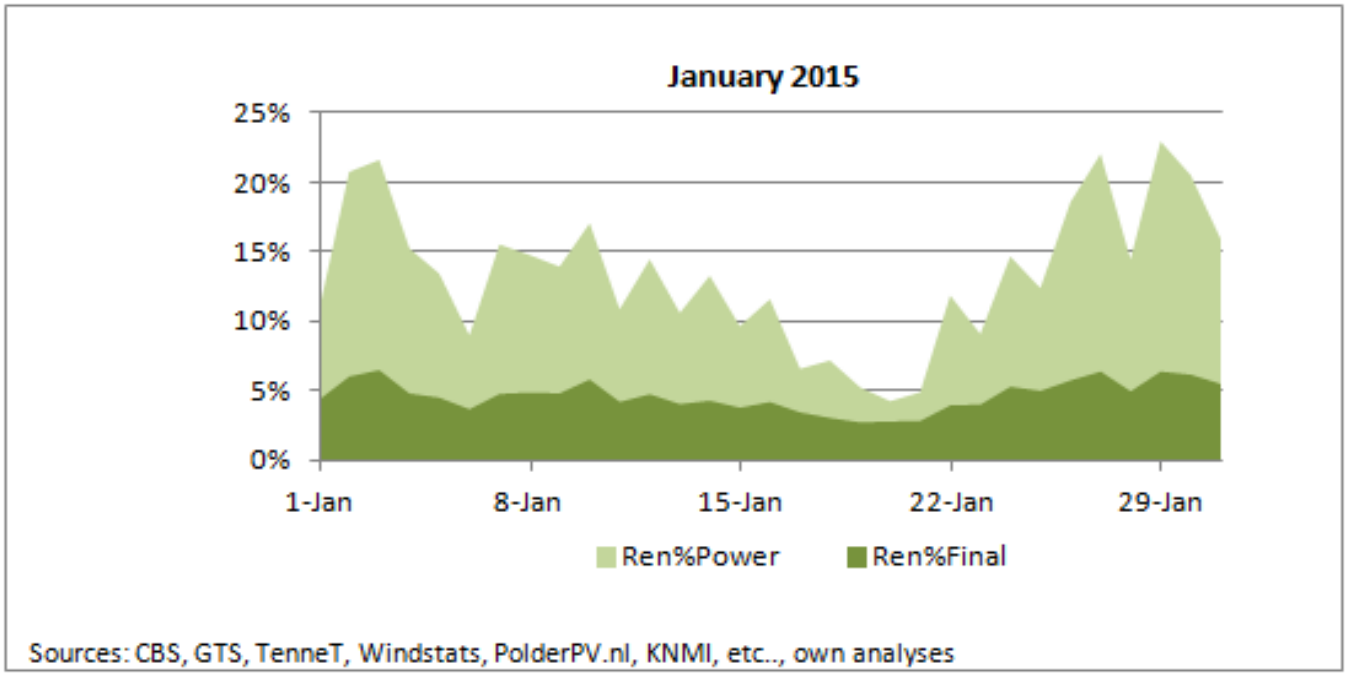

In January, the percentage of renewable power varied widely. The percentages renewable power and energy have been estimated using the formal EU/IPCC procedures.

SELECTED MONTHLY ENERGY DATA

Gas Demand
(excluding gas-to-power)
2016 (and 2015)

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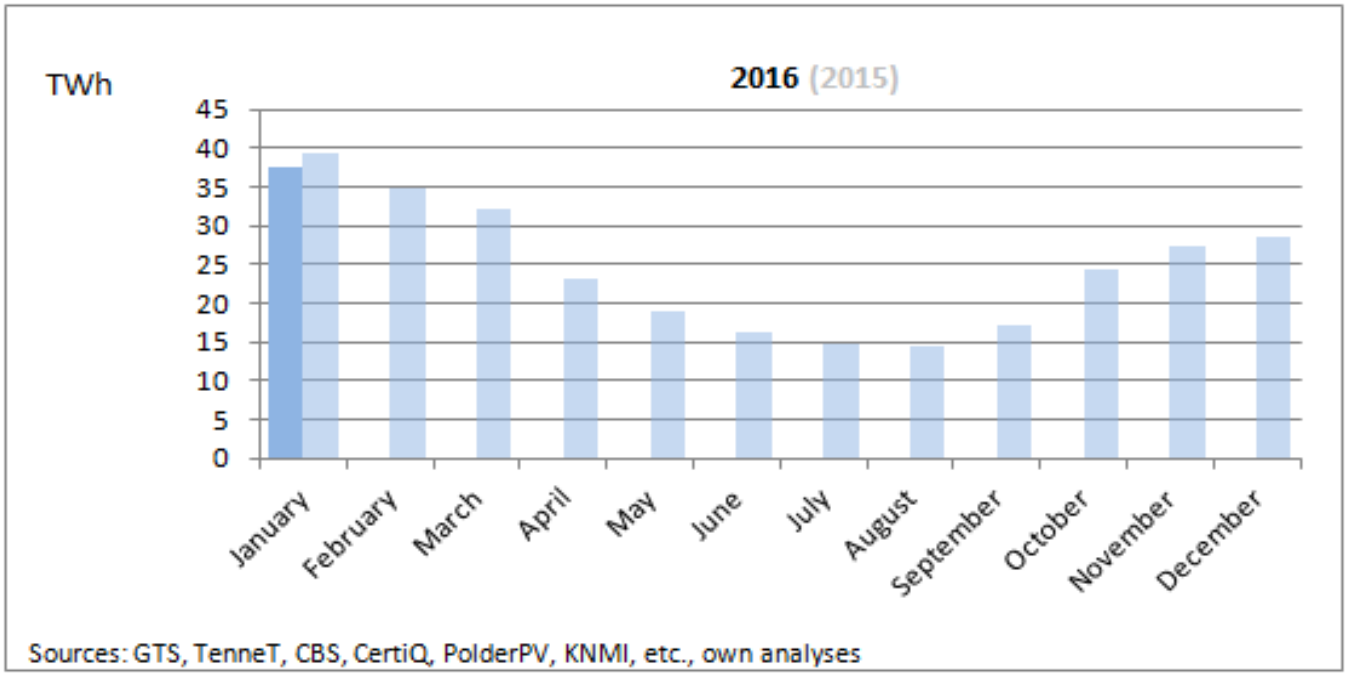
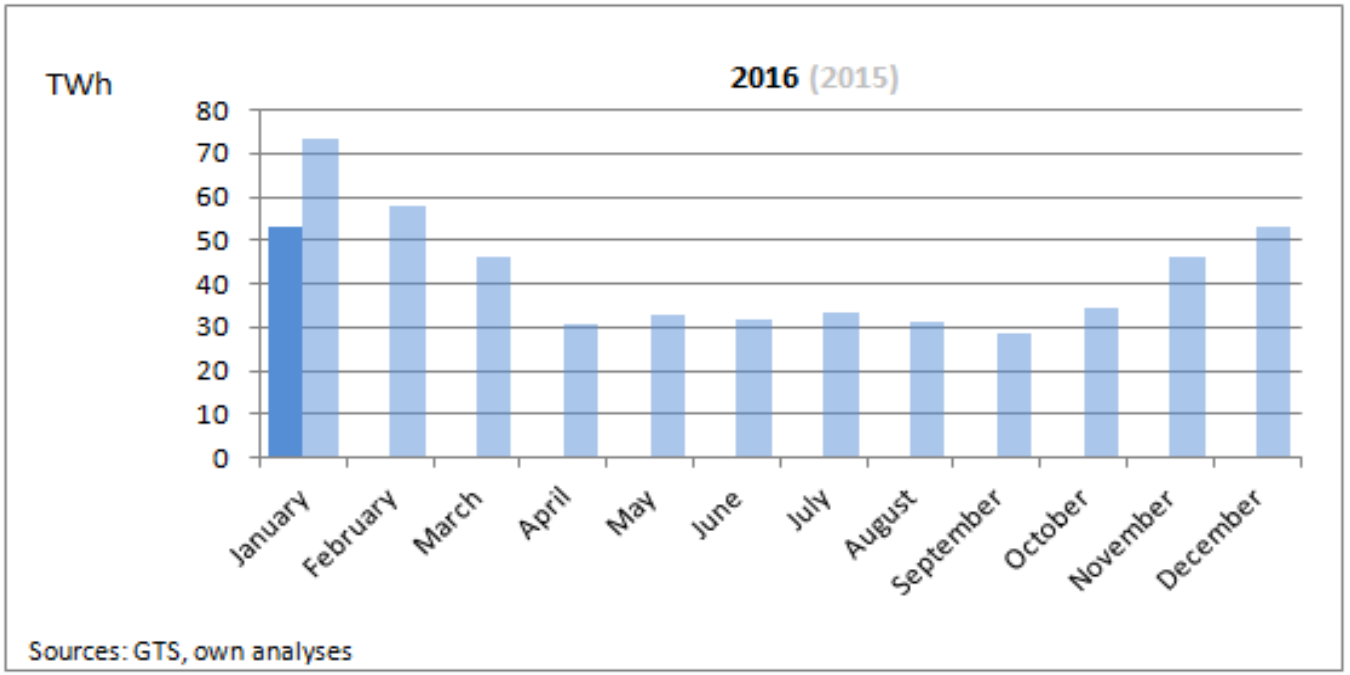


Gas consumption in January, excluding gas-to-power, was lower than last year, due to mainly due to higher ambient temperatures.

Gas Production 2016 (and 2015)



Due to a much lower production from the Groningen gas field and declining gas production from the North Sea.

Power Demand 2016 (and 2015)

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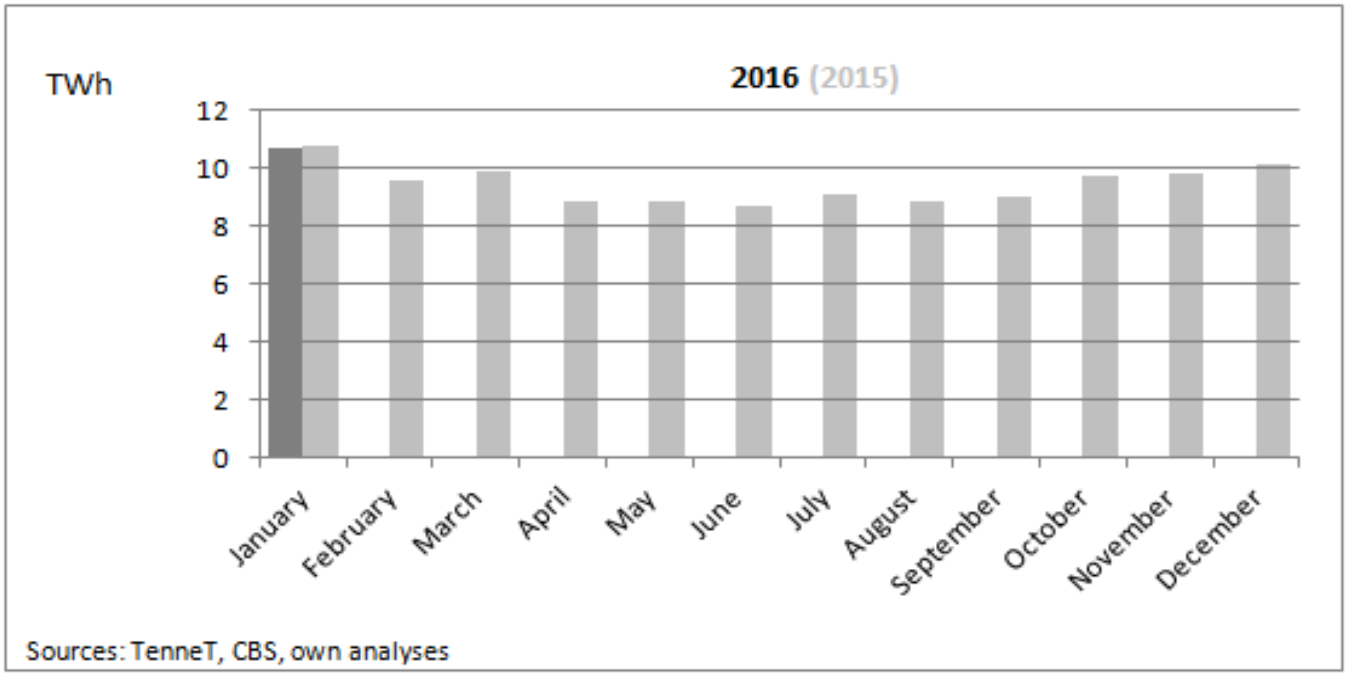

Power demand in January was 1% lower than last year.

Wind Production 2016 (and 2015)

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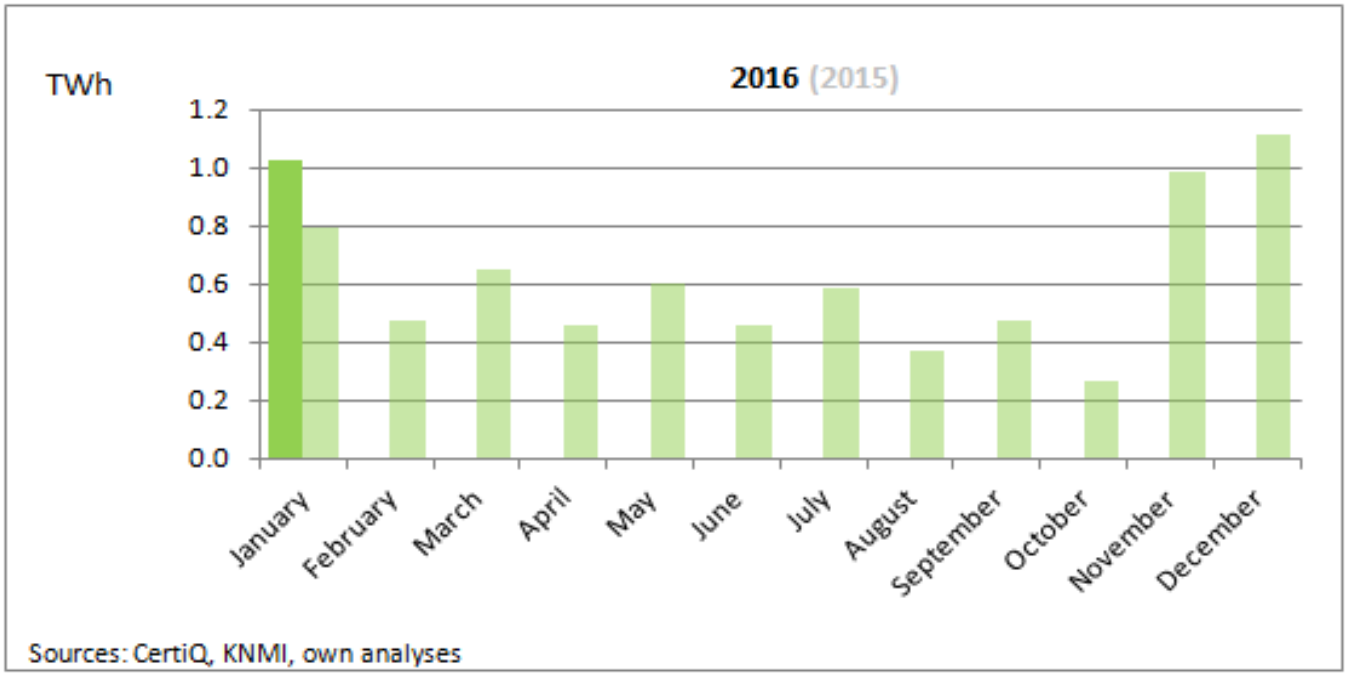
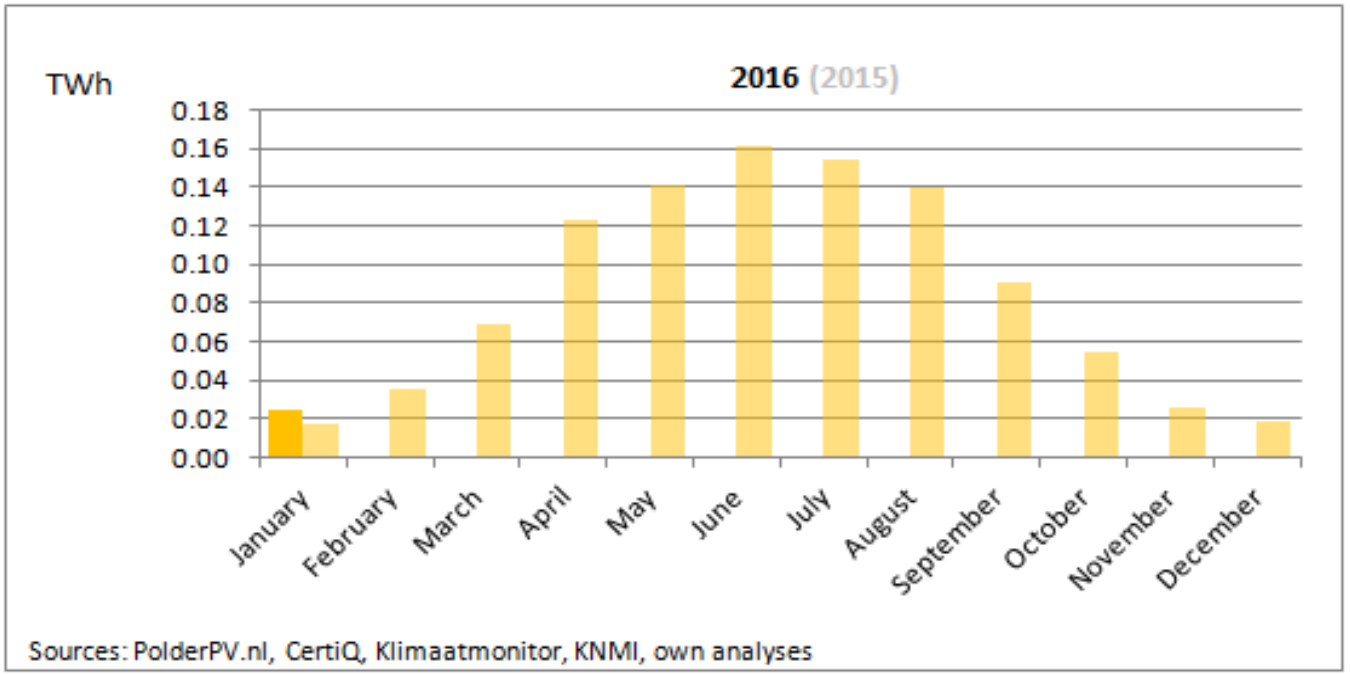


Wind production in January 2016 peaked to 1.03 TWh, significantly higher than in 2015.

In January 2016, the average utilization of wind capacity was 41%.

Solar PV Production 2016 (and 2015)



In January 2016, electricity generation by Solar PV in The Netherlands was low, and the average utilization rate of solar-PV capacity was (only) 2%.

Coal-to-Power 2016 (and 2015)

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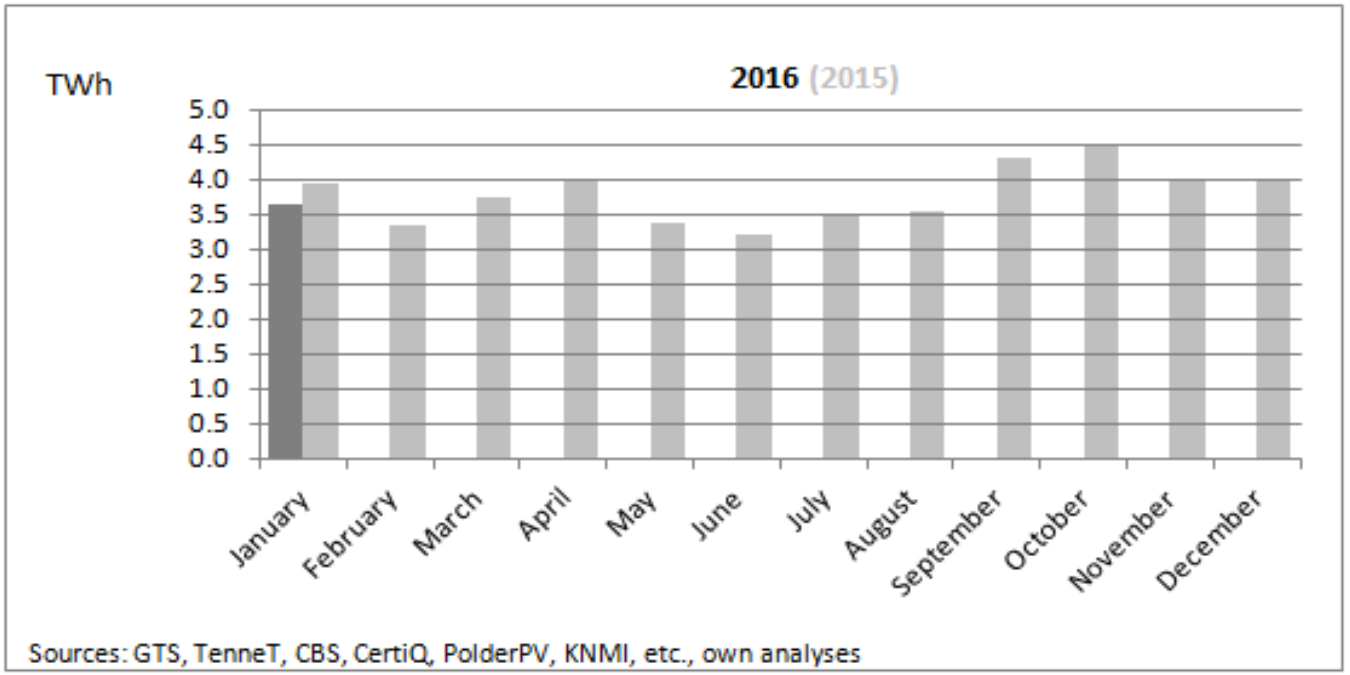

In January coal-fired power generation was slightly lower than last year, due to the closure of some coal-fired power stations in December.

Gas to Power
2016 (and 2015)

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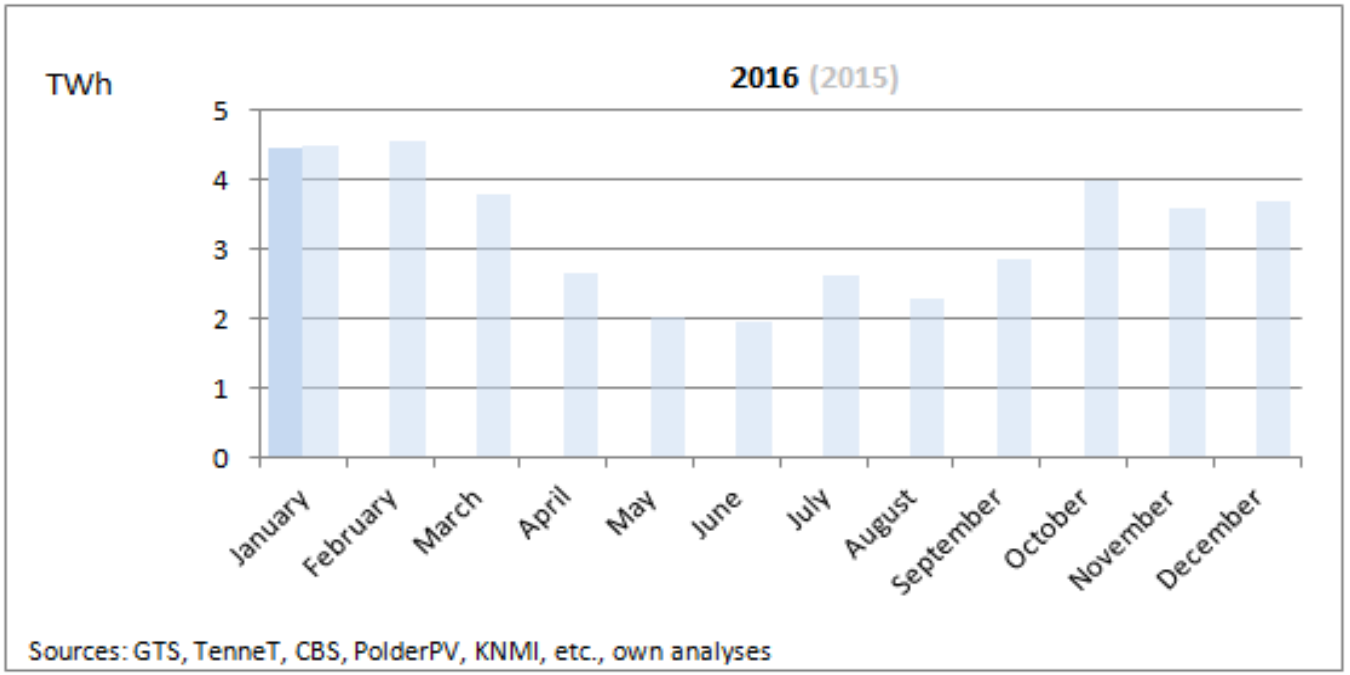
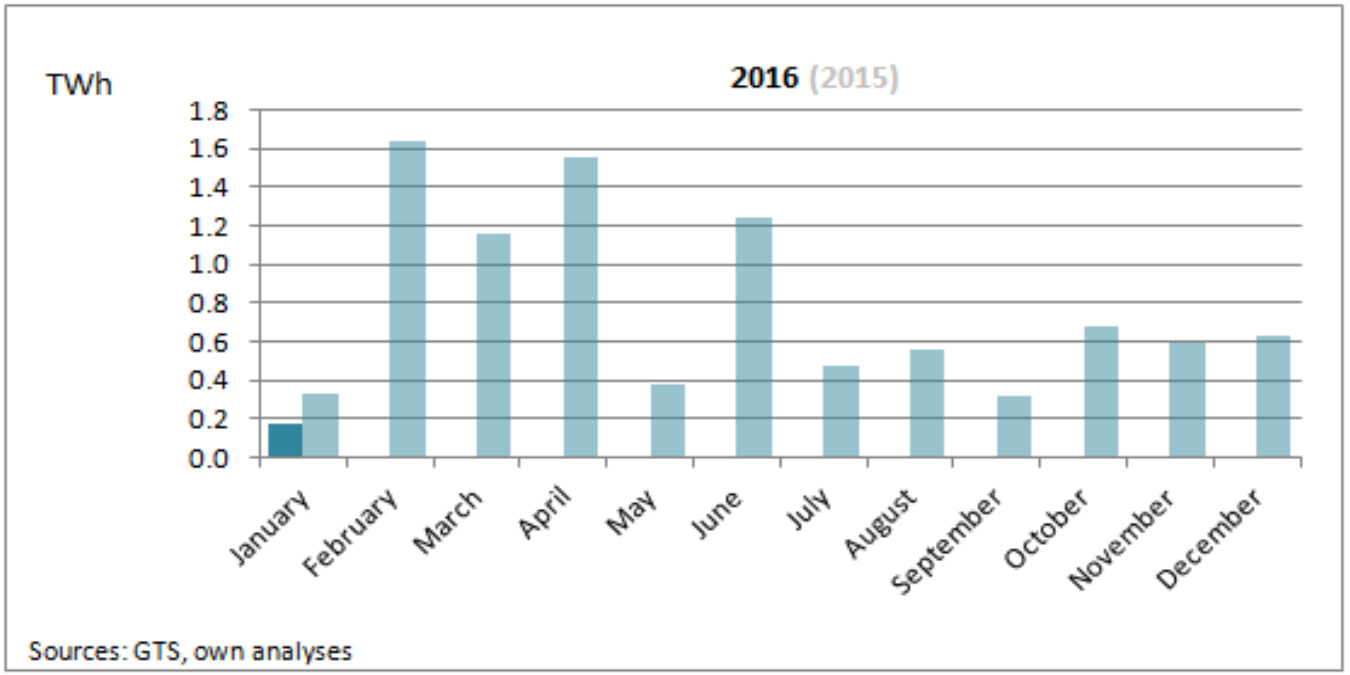


In January 2016, power production by gas-fired power stations and cogeneration was similar than previous year.

LNG imports 2016 (and 2015)



This figure depicts the amount of LNG injected into the gas grid, as presented by GTS.

The figure excludes the usage of LNG as transport fuel.

Renewable Energy
All Sources
2016 (and 2015)

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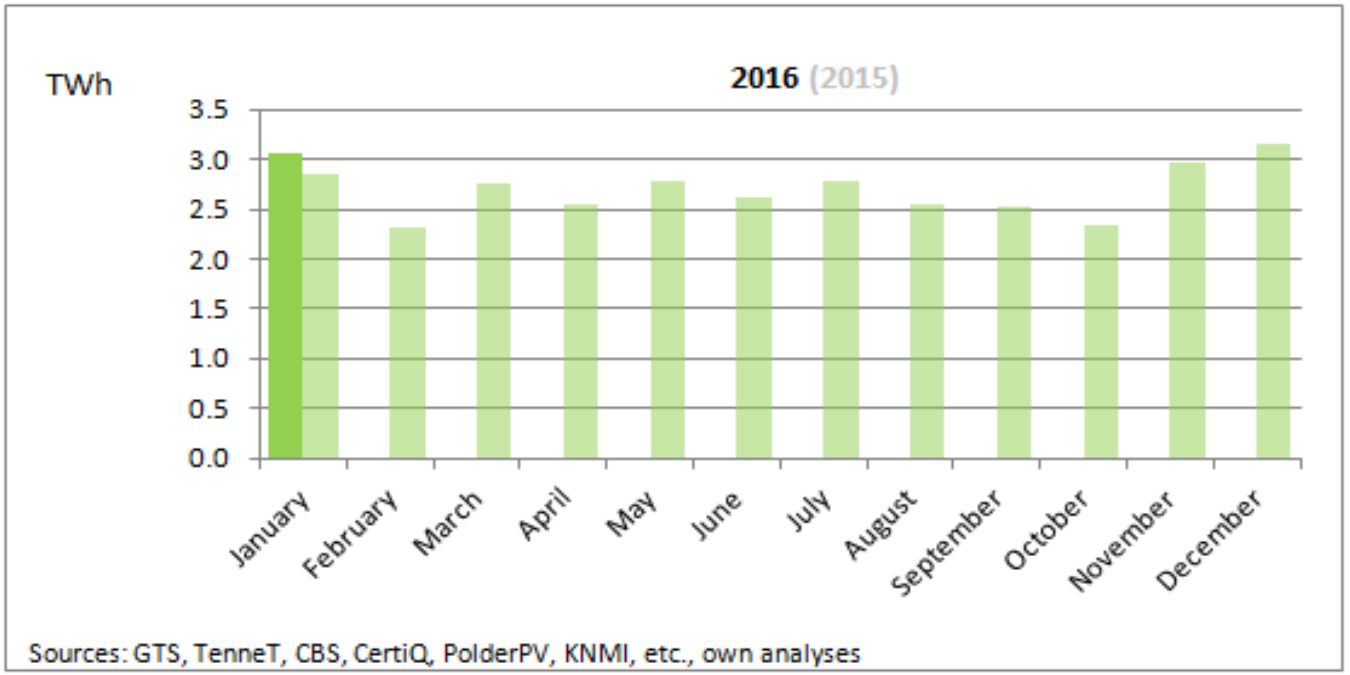

Renewable energy production in The Netherlands was 7% higher than last year.

Renewable Energy Percentage 2016 (and 2015)

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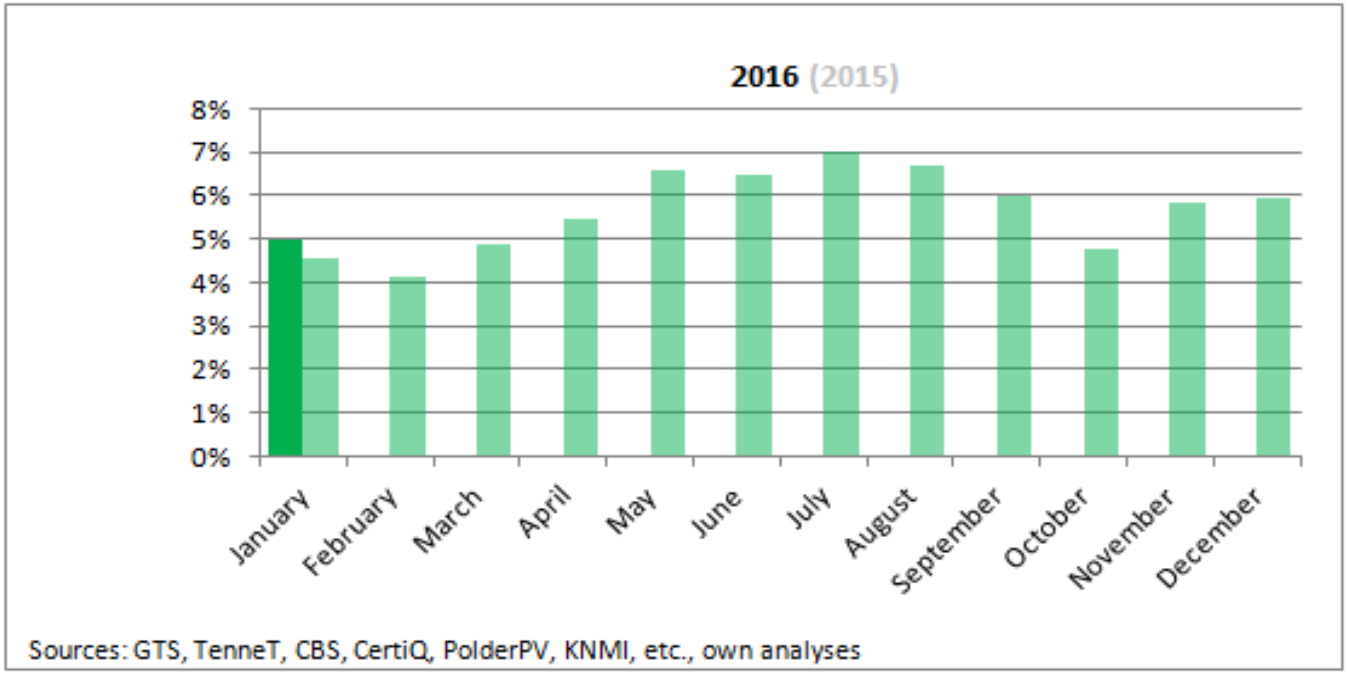

In January, the percentage of renewable energy, based on final energy usage was higher than last year, due to high availability of wind. The percentage has been calculated according to the formal EU/IPCC procedures.

CO2 Emissions 2016 (and 2015)

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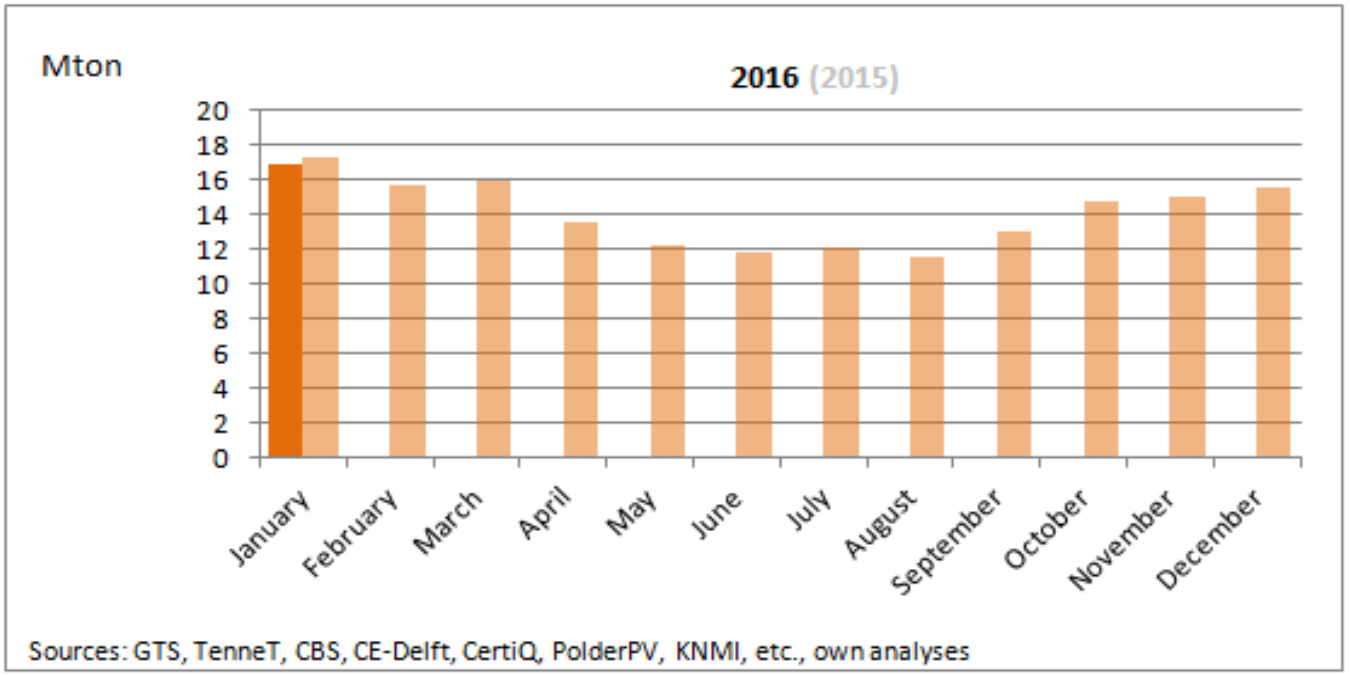

After a significant rise of the CO2 emissions in 2015, compared to 2014, the CO2 emissions in January were slightly lower than previous year.

ENERGY DEMAND IN A NUTSHELL

Energy Demand January 2016

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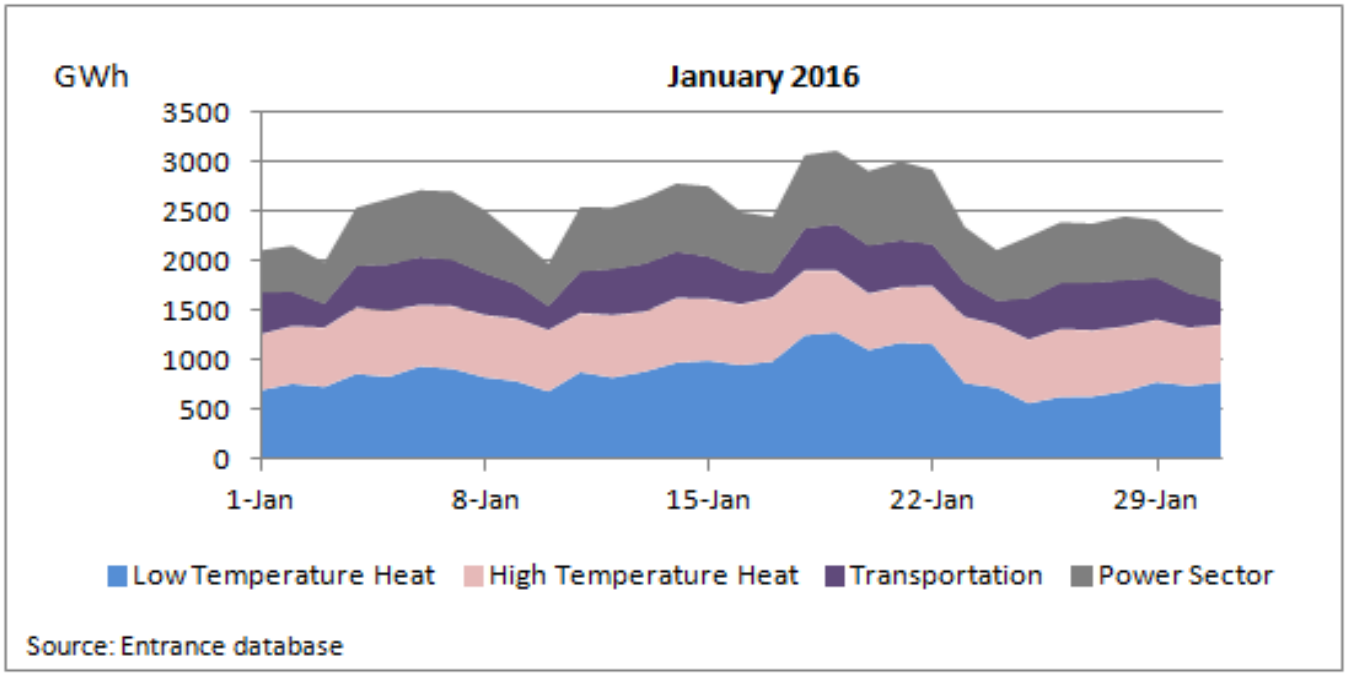
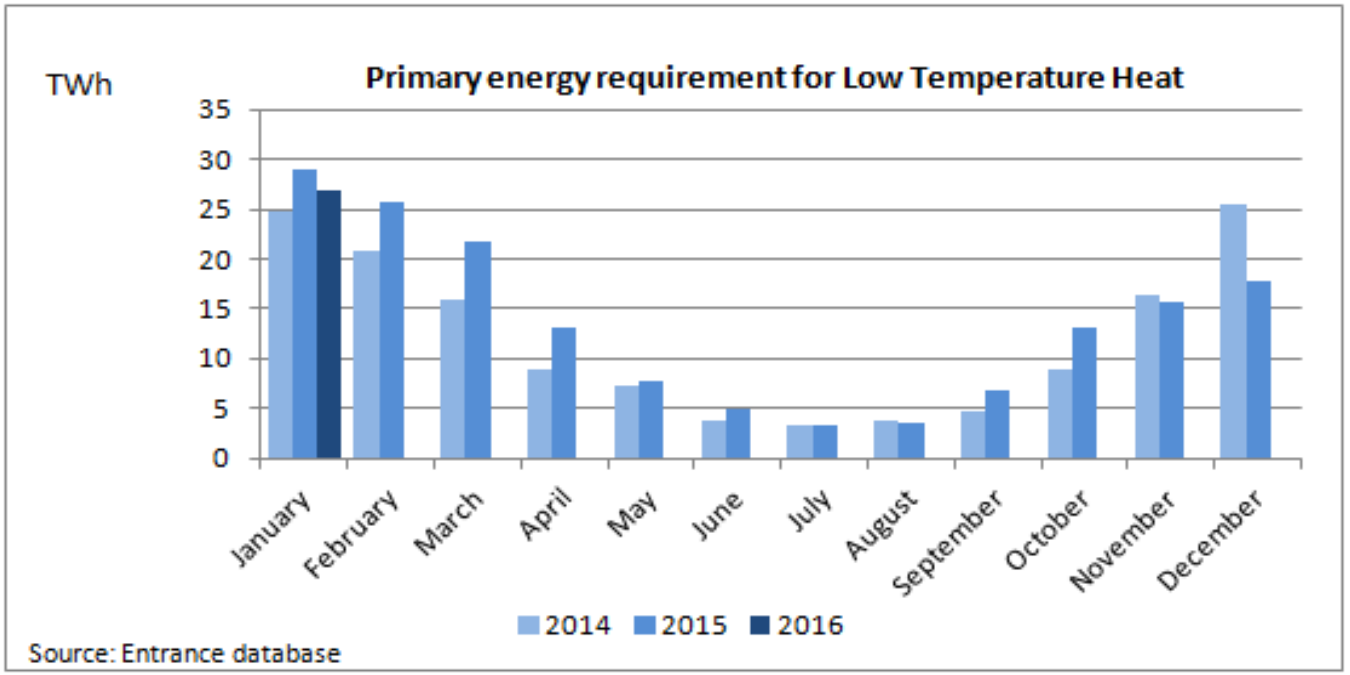


Dutch government has allocated Energy Demand in four categories. These categories (and this figure) do not take into account energy demand for international shipping, aviation and feedstock.

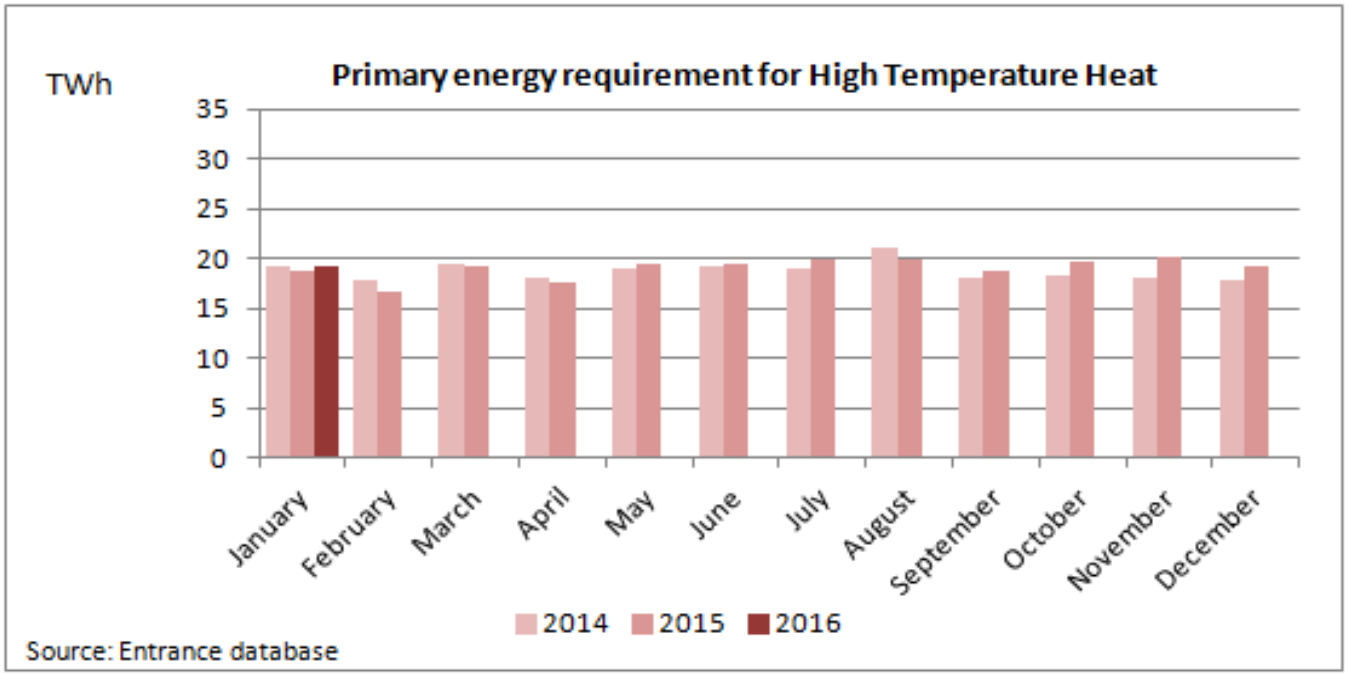
(1 GWh is about equal to the average daily energy production of 40 wind turbines of 3 MW each)

Energy Demand
Low Temperature Heat



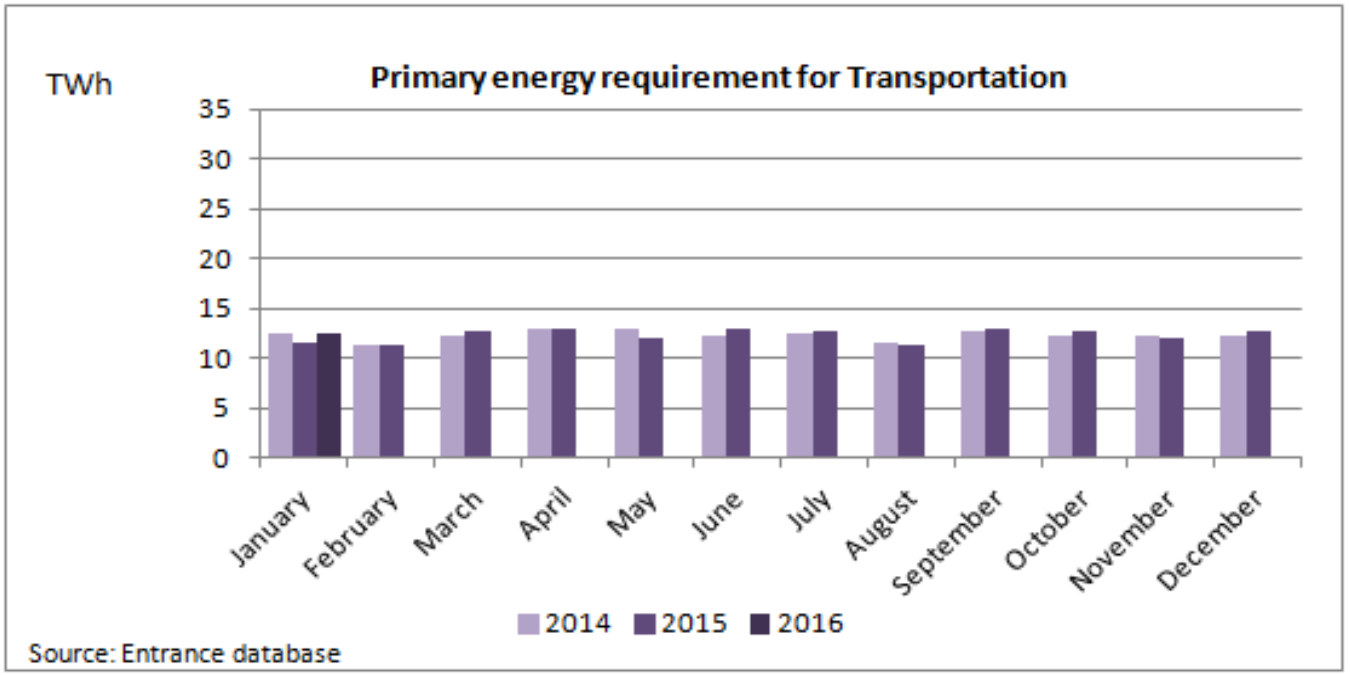
The primary energy requirement for Low Temperature Heat(mainly buildings and green houses) varies mainly with ambient temperature.

Energy Demand
High Temperature Heat



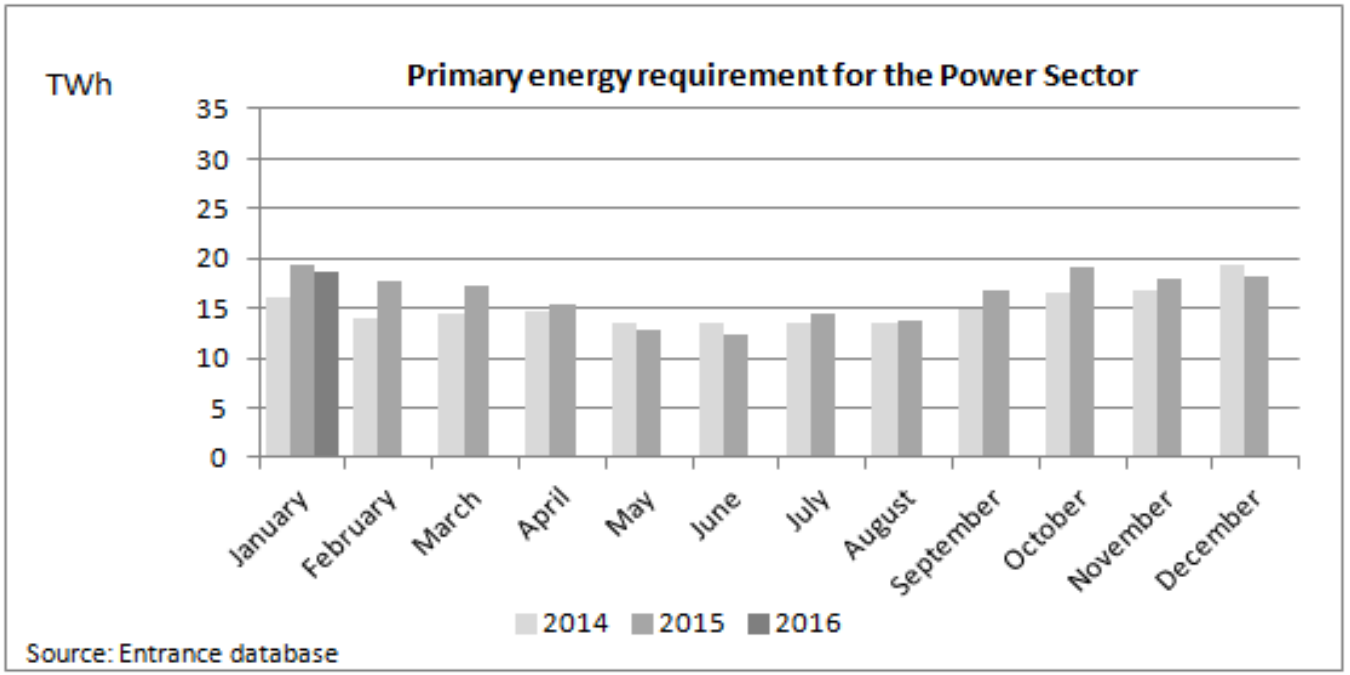
The primary energy requirement for High Temperature Heat (mainly industry) varies with the economic activity in the Netherlands.

Energy Demand Transportation



The primary energy requirement for Transportation (excluding international shipping and aviation) varies with the economic activity in the Netherlands. Fuels that are bought abroad, due to lower taxes, are not included in this figure.

Energy Demand
Power Sector



The primary energy requirement for the power sector varies mainly with the economic activity and the fraction of renewable power. This figure excludes the primary energy demand due to power imports.

CO2 Emissions January 2016

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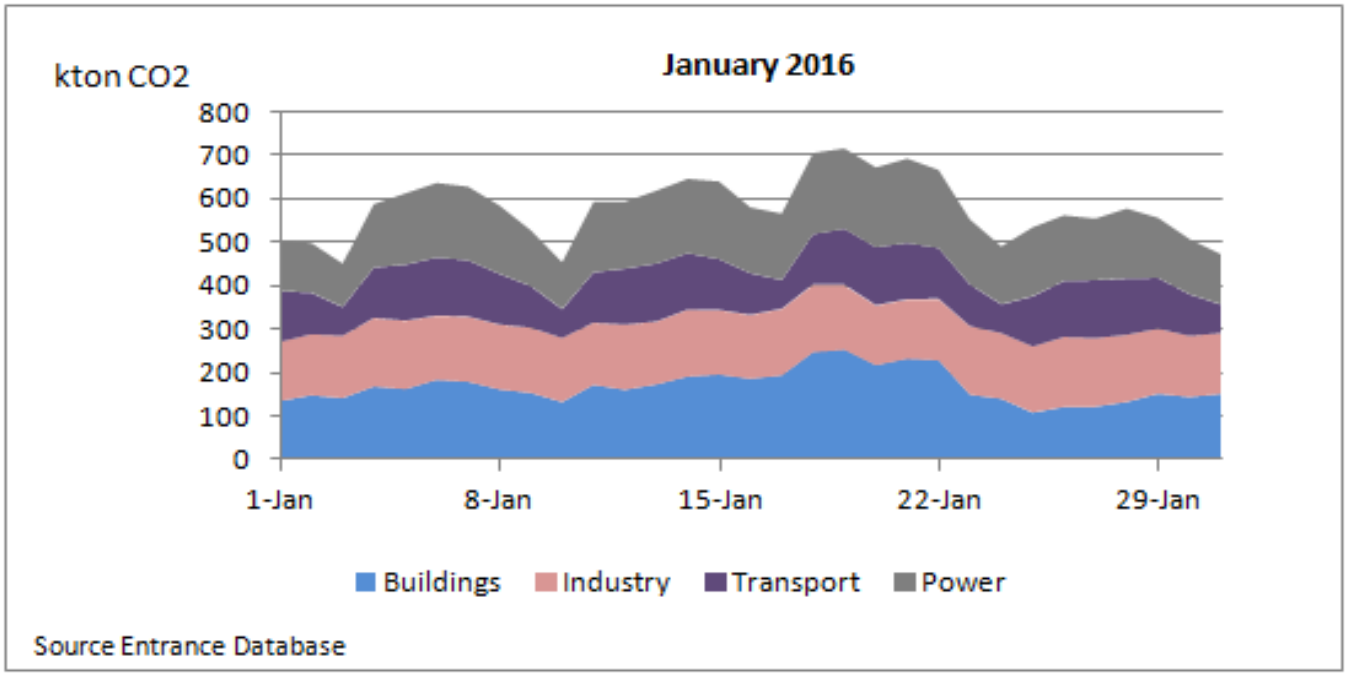

This figure shows the daily CO2 emission of each of the four demand sectors.

This figure does not take into account the energy demand for shipping, aviation and feedstock.

(1 kton CO2 is equal to the average daily CO2 emission of 90.000 households, each using 1500 m3 gas and 3500 kWh electricity annually.

CO2 emissions
Low Temperature Heat

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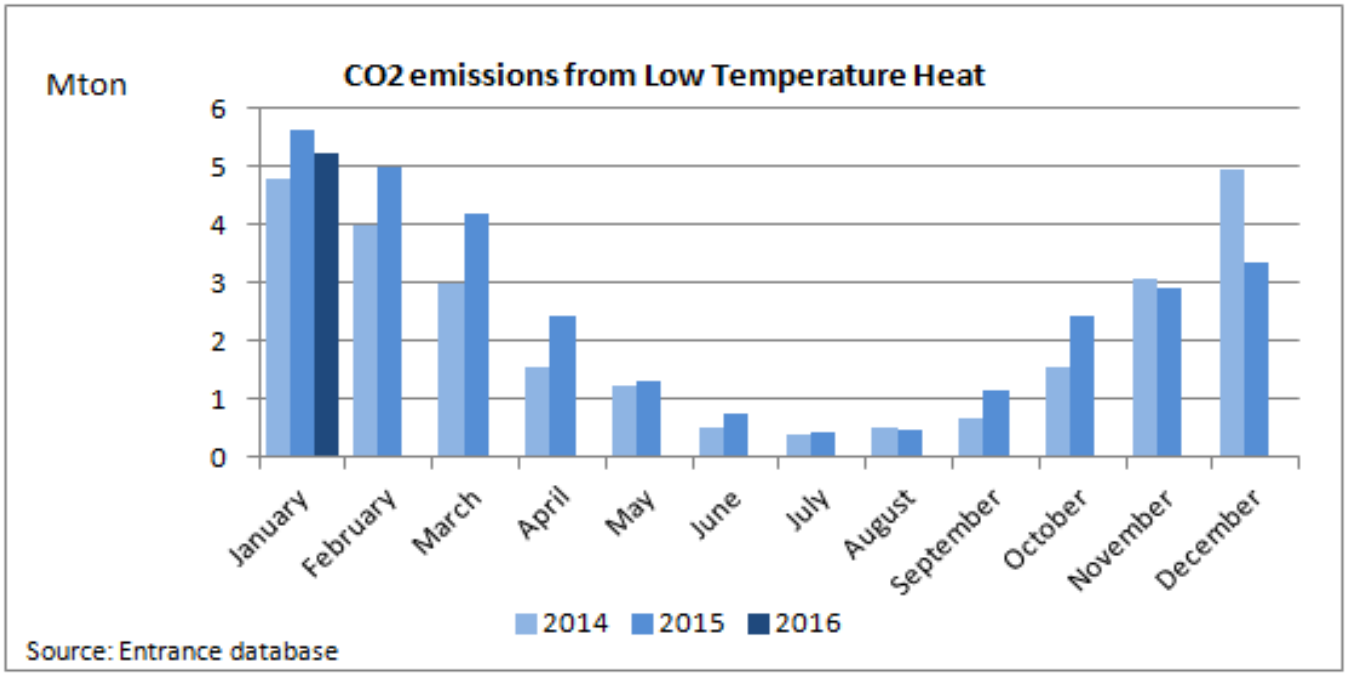

CO2 emissions from Low Temperature Heat , mainly buildings and green houses, vary with ambient air temperature and the fraction of renewable energy which is used, biomass and heat pumps.

CO2 emissions
High Temperature Heat

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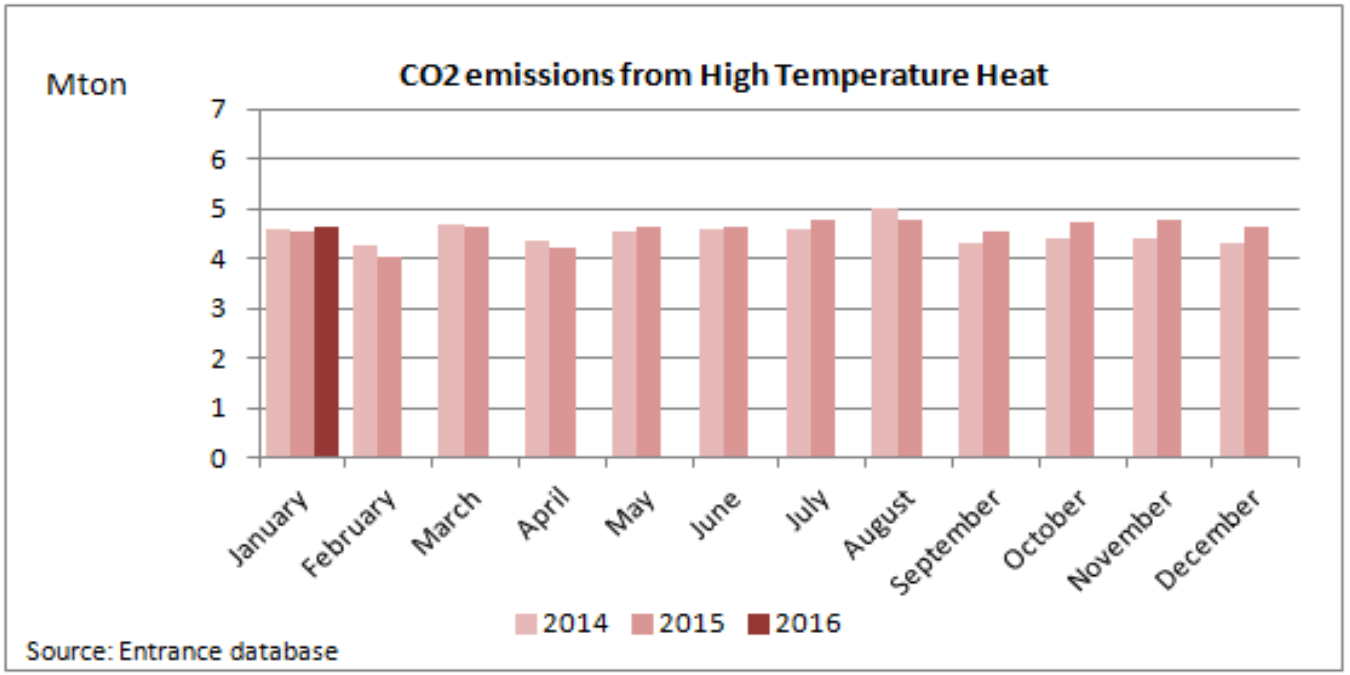
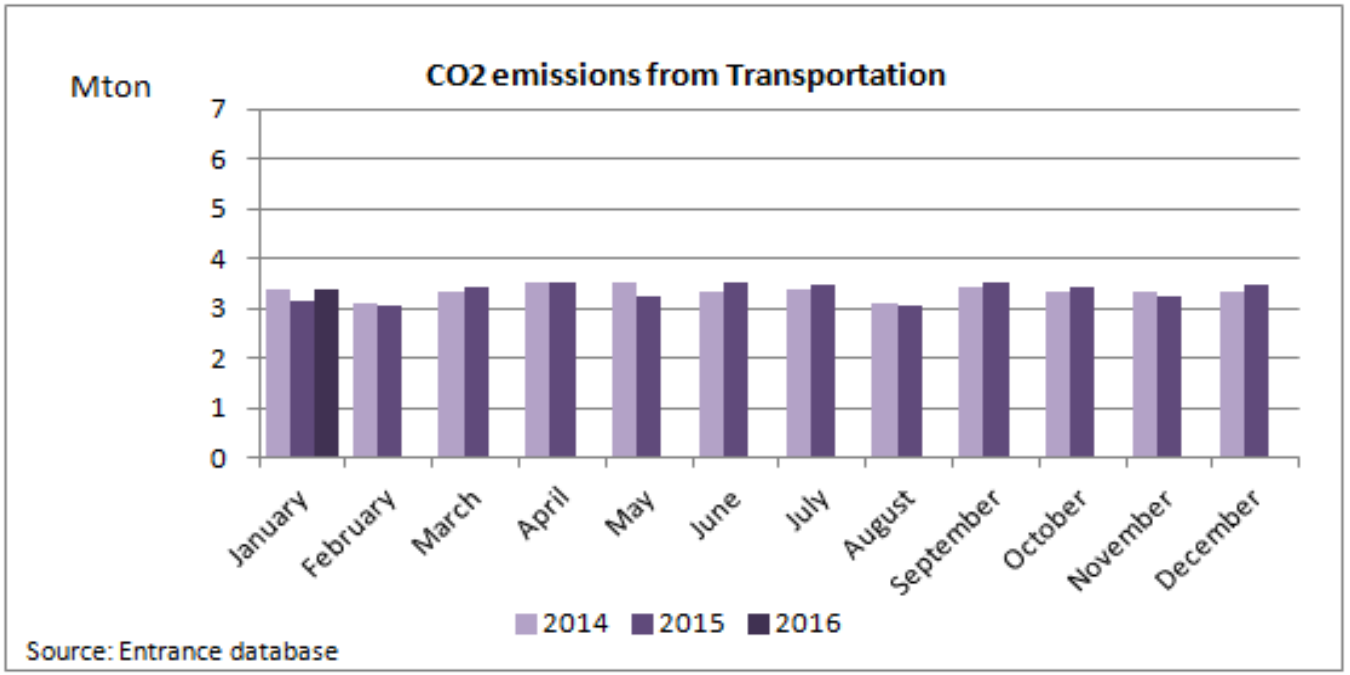


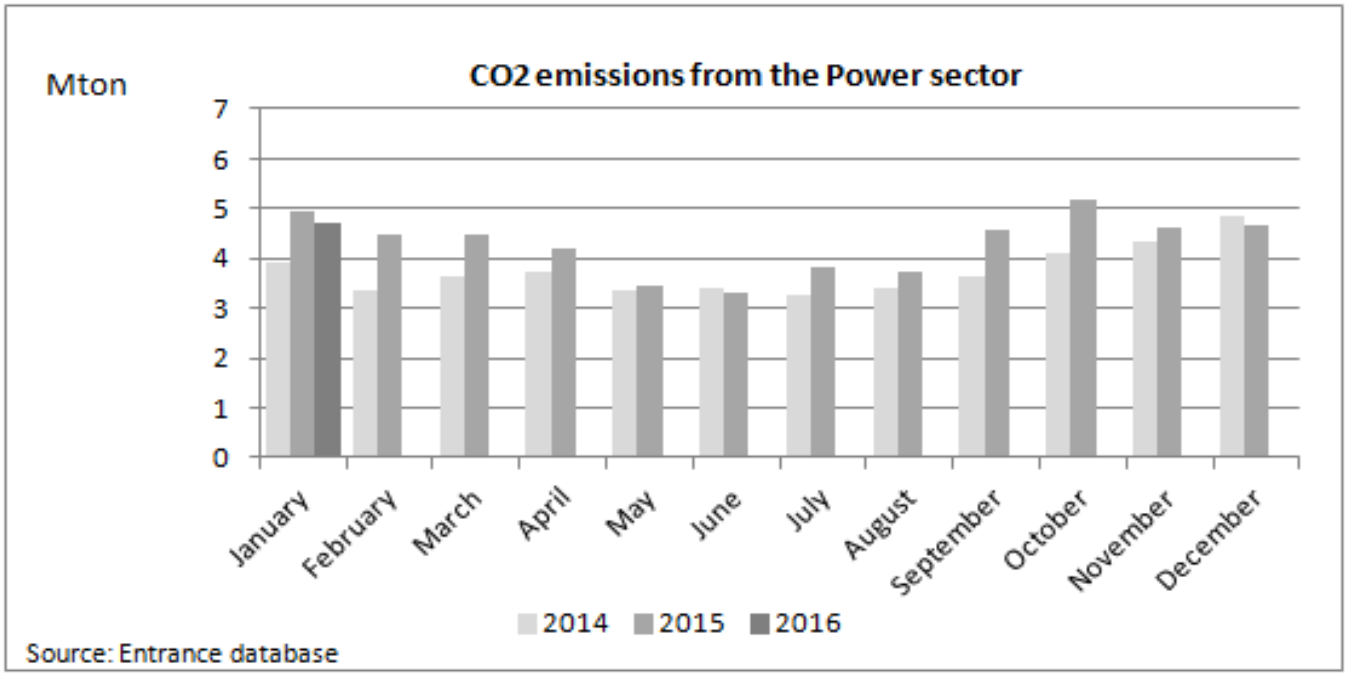
CO2 emissions from High Temperature Heat, mainly industry, vary mainly with the economic activity in the Netherlands.

CO2 emissions Transportation



CO2 emissions from Transportation (excluding international shipping and aviation) vary with the economic activity in the Netherlands. Fuel that is bought abroad, due to lower taxes, isnot included in this figure.

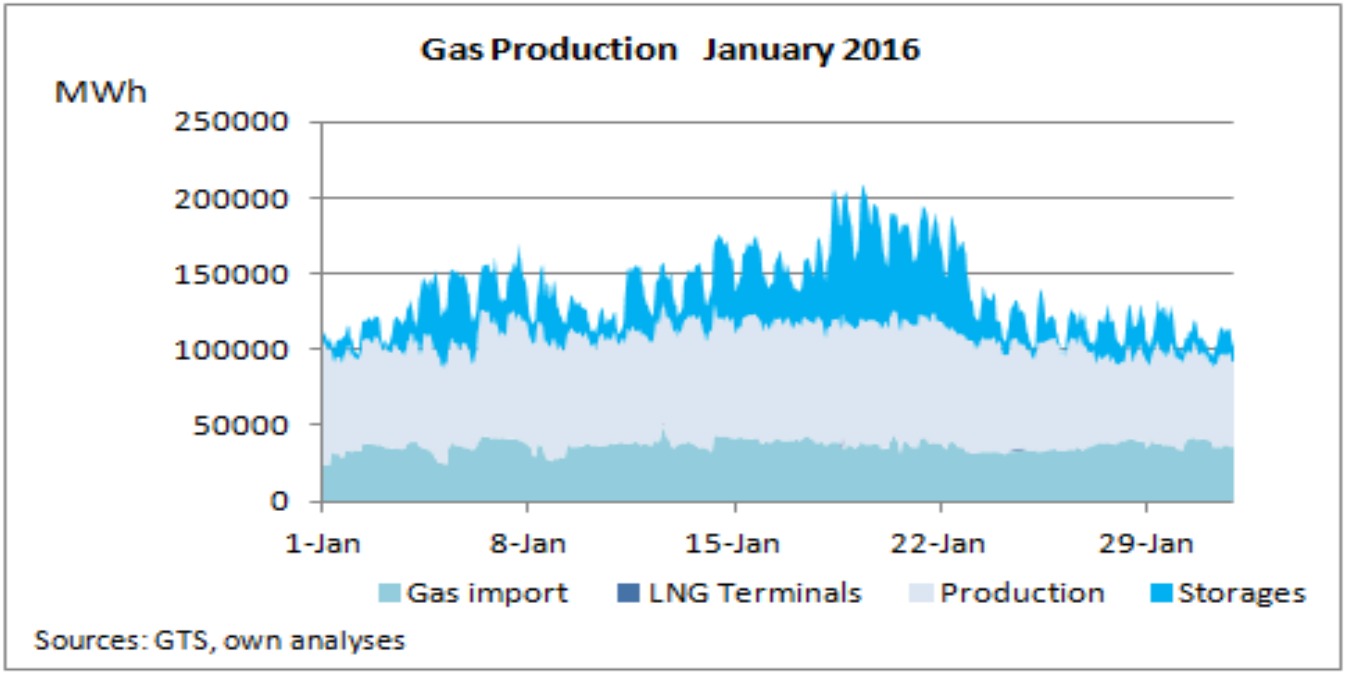
CO2 emissions Power Sector



CO2 emissions from the power sector vary with the economic activity in the Netherlands, the amount of coal used for power generation, the amount of renewable power produced, and the level of power imports.

SELECTED HOURLY ENERGY DATA

Gas Supply January 2016



The peak in the gas consumption from 19-23 January has been covered by the gas storages. Gas supply includes Dutch consumption and exports.

Gas Demand
Including Gas-to-Power
January 2016

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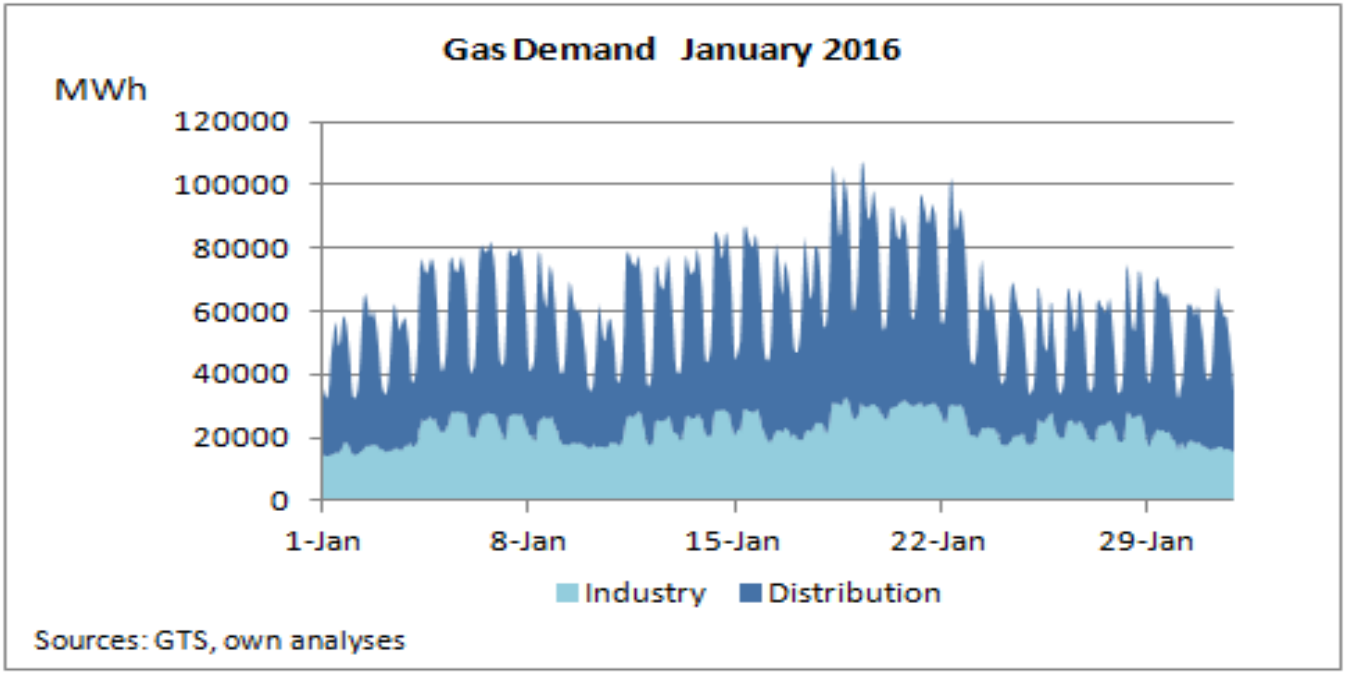

In January, ambient temperatures have been relatively high and gas demand for heating purposes was relatively low.

Gas Imports & Exports January 2016

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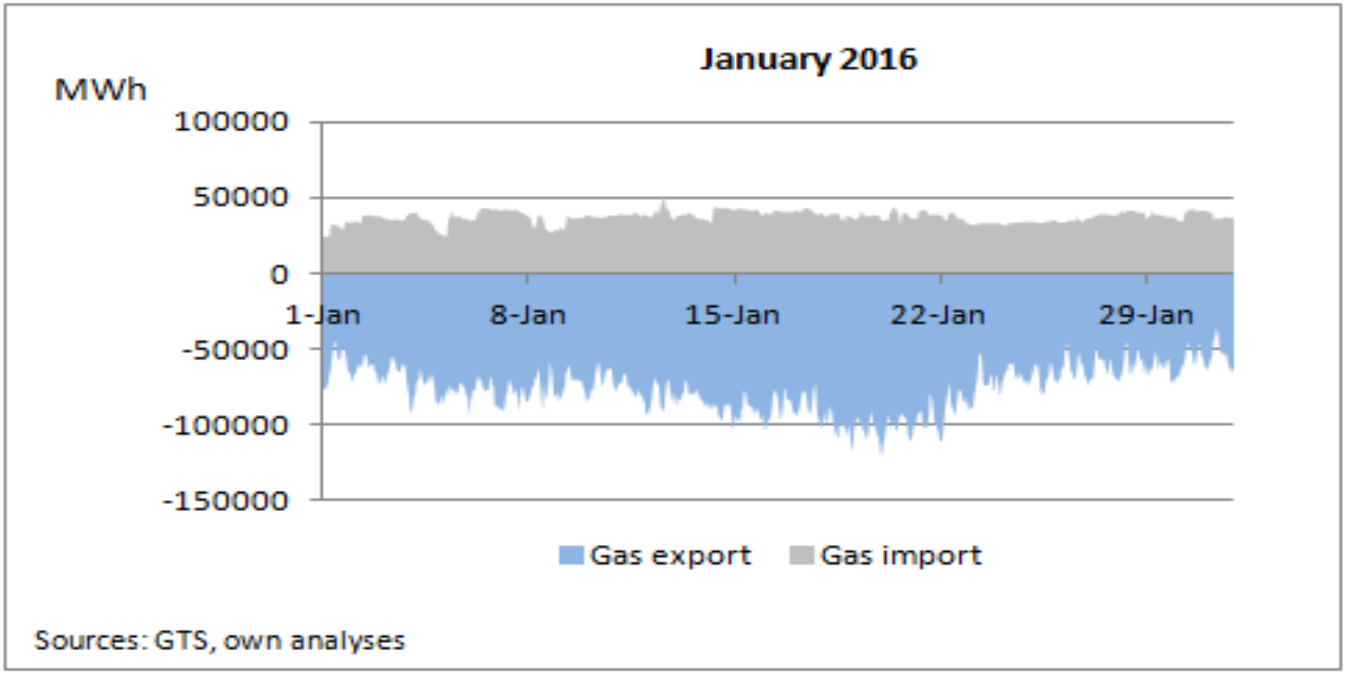

In January, gas exports were considerable higher than gas imports.

Power Imports & Exports January 2016

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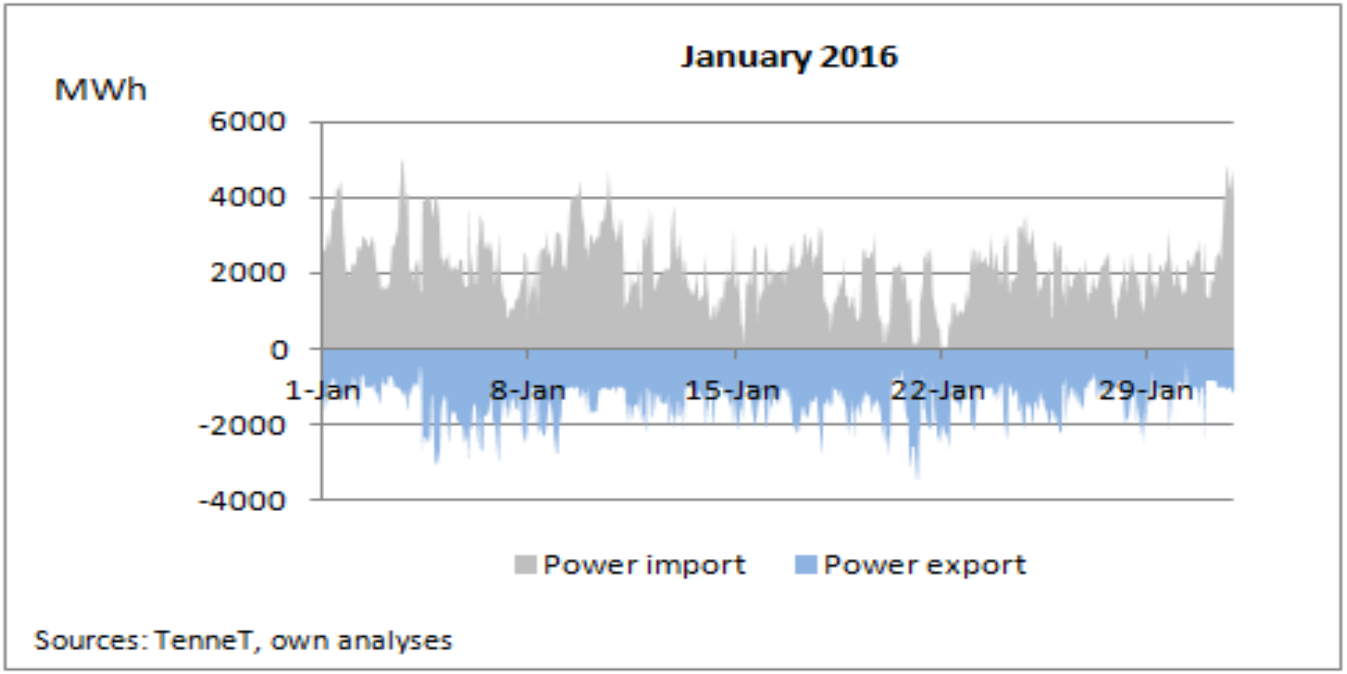
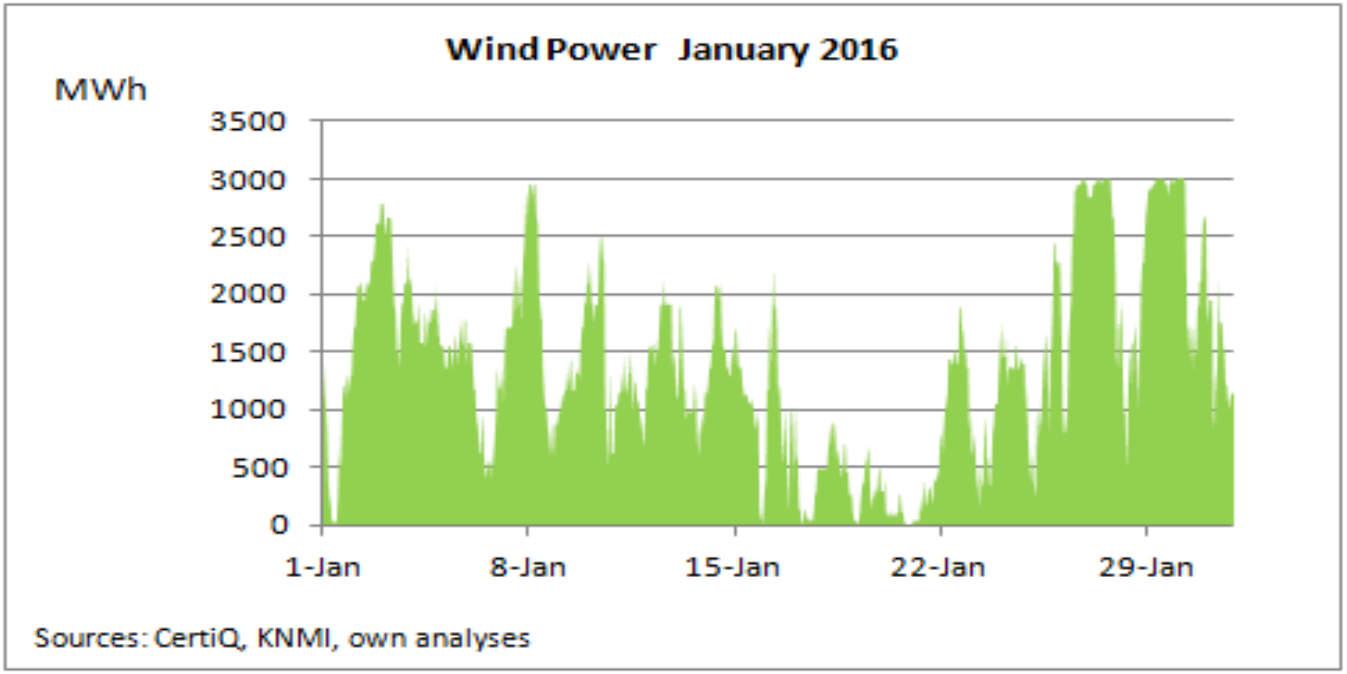


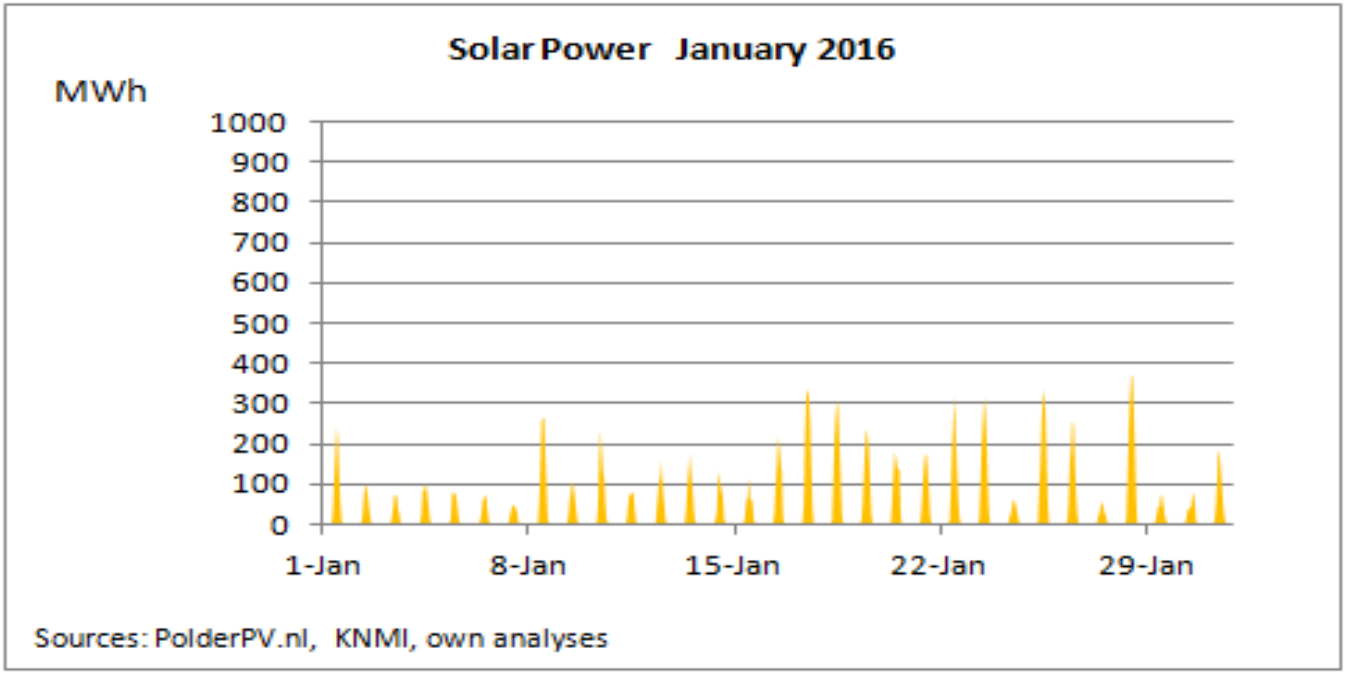
In January 2016, the power imports and exports have been rather volatile. In January power imports were 1.6 TWh, while power exports were 1.1 TWh.

Wind Power January 2016



January 2016 was characterized by high wind availability (utilization rate 41%).

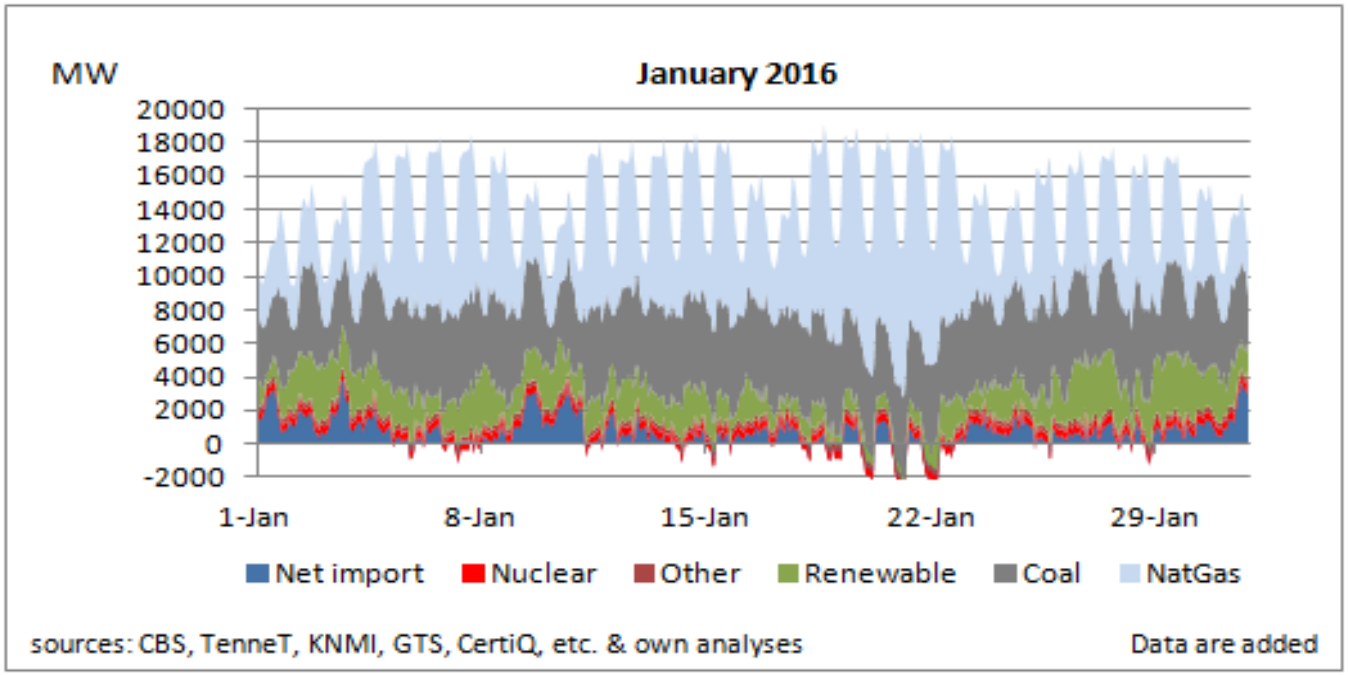
Solar PV Power January 2016



January was not very sunny and hence, the utilization rate of the more than 1400 MW of solar PV installed was just 2%.

The following set of slides presents for each month in 2016 the hourly contributions of various energy sources to total power consumption in The Netherlands.

Power Generation January 2016



In the week of 19-23 January, gas-fired power generation peaked, due to low wind availability and net exports that occurred simultaneously.

The following set of slides presents for each week in 2016 the hourly contributions of wind and solar-PV to the total power consumption in The Netherlands.

Hourly Solar-PV and Wind Generation 2016

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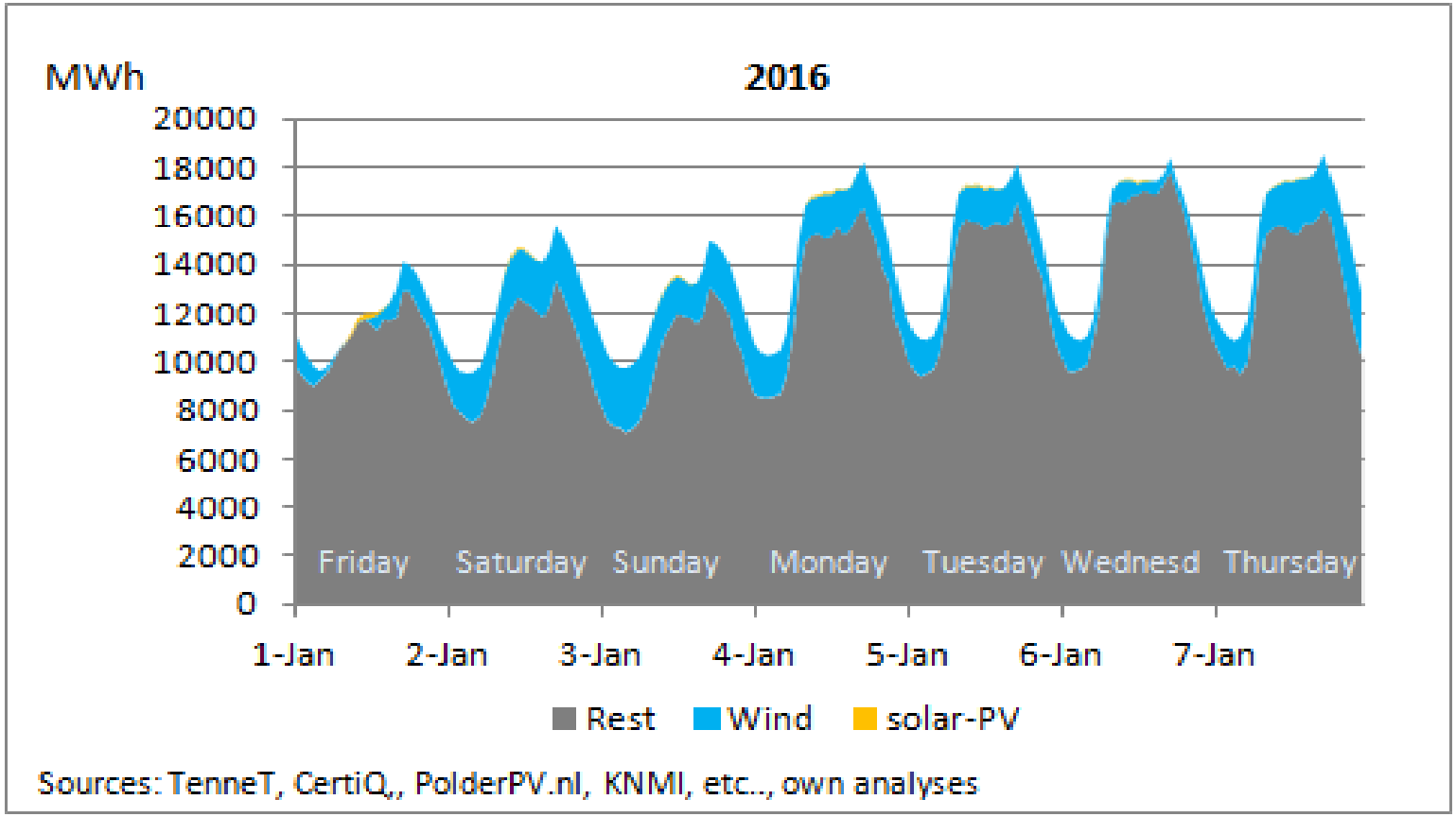

Hourly Solar-PV and Wind Generation 2016

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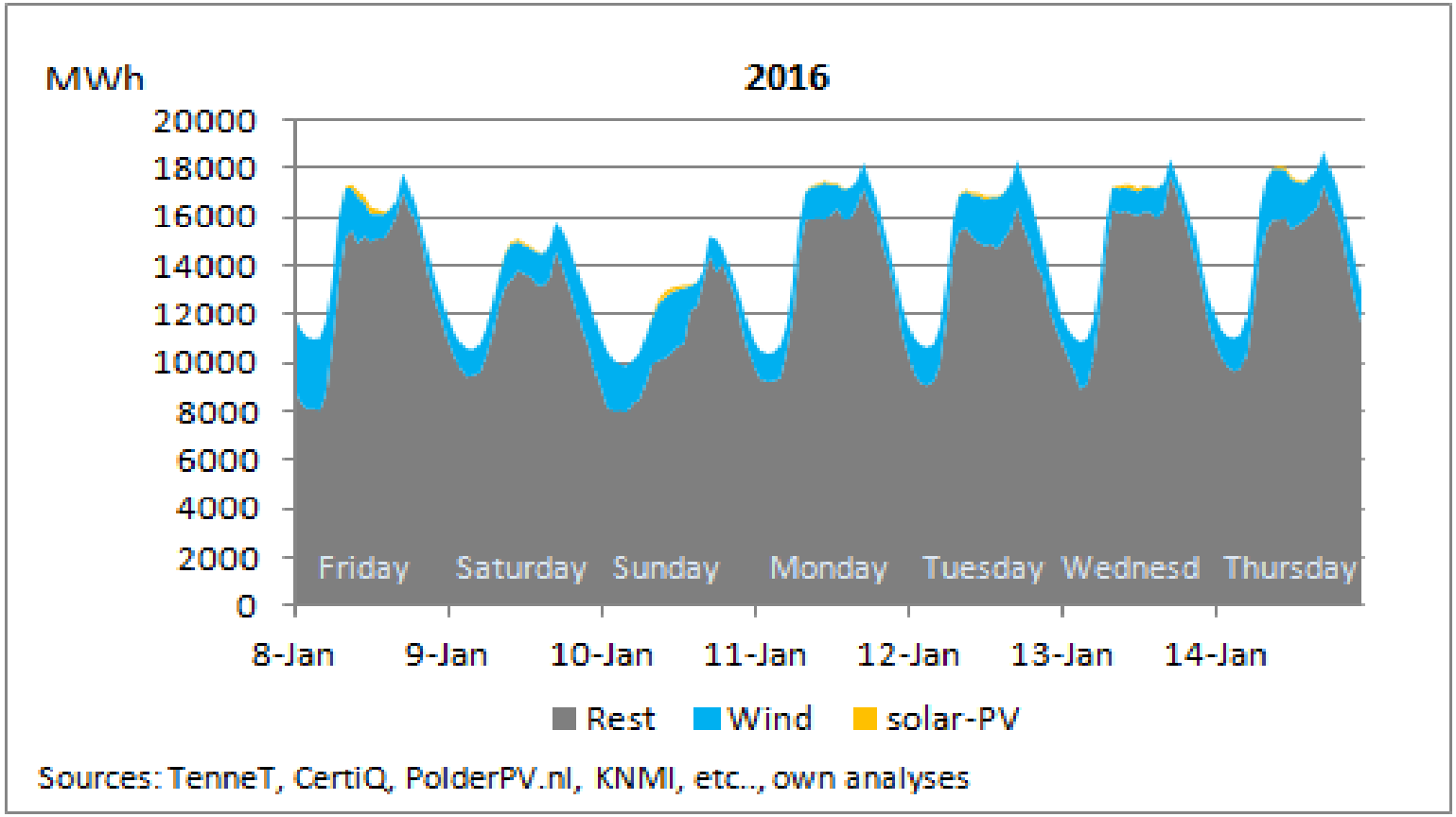

Hourly Solar-PV and Wind Generation 2016

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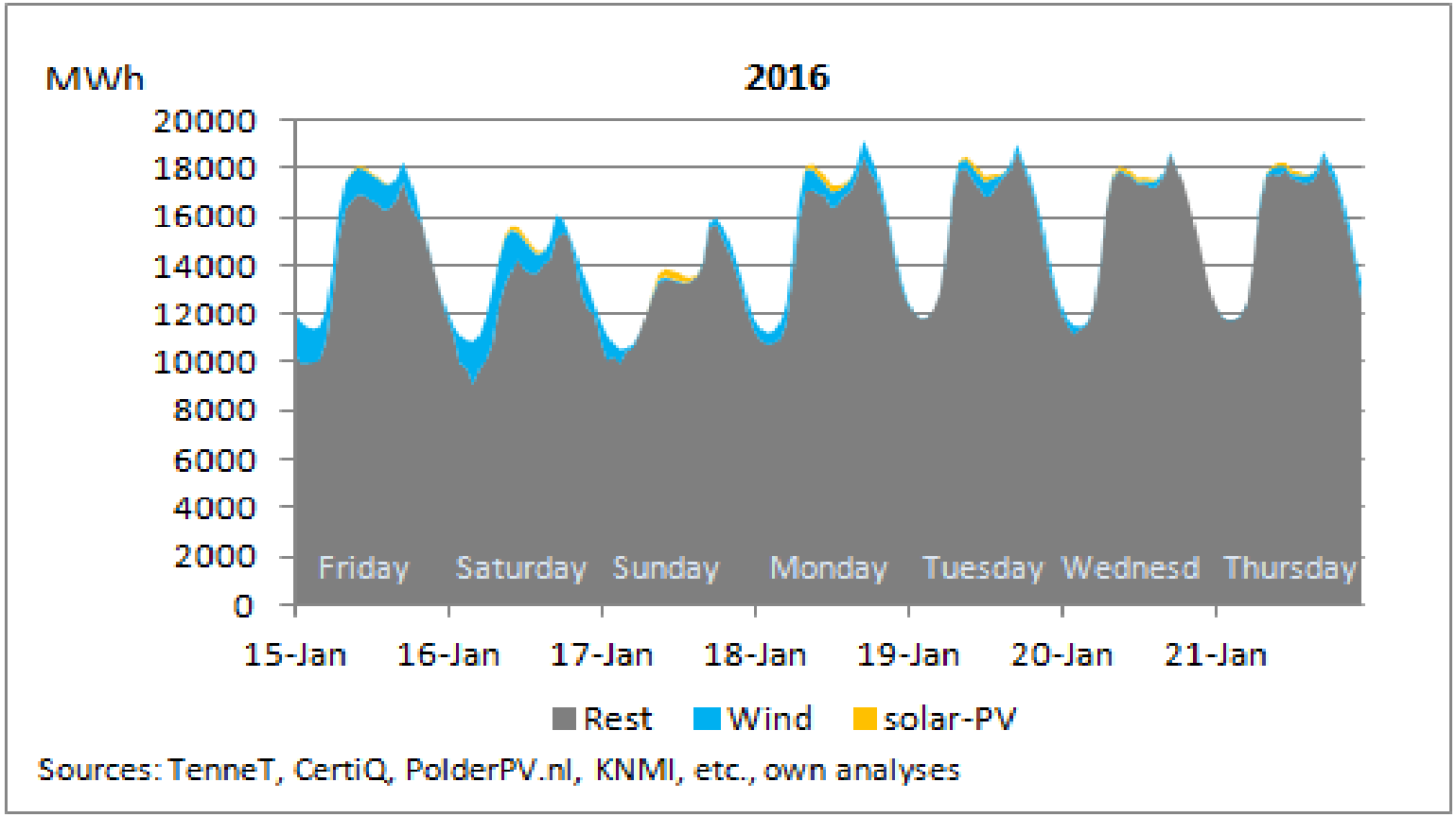

Hourly Solar-PV and Wind Generation 2016

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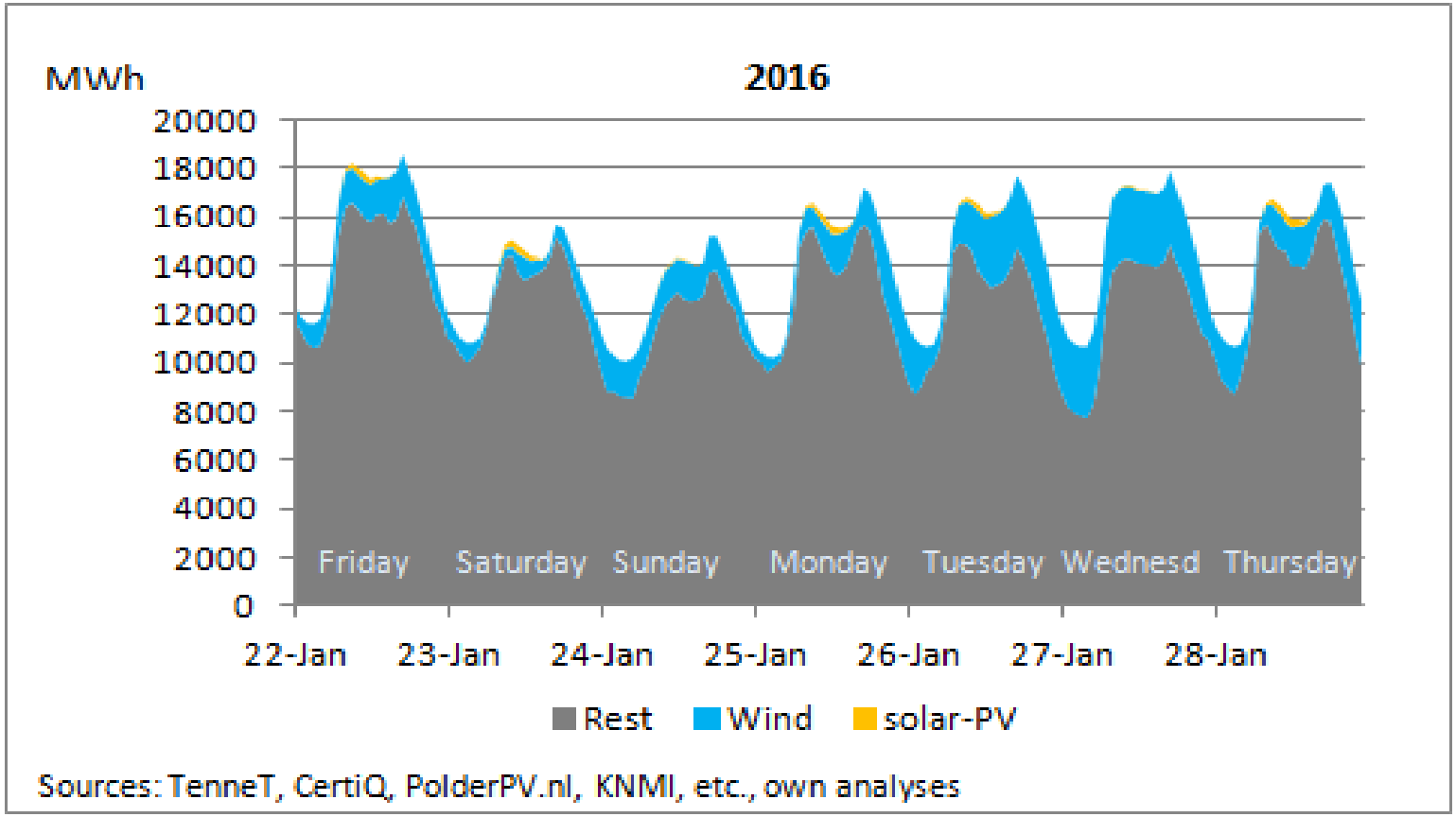
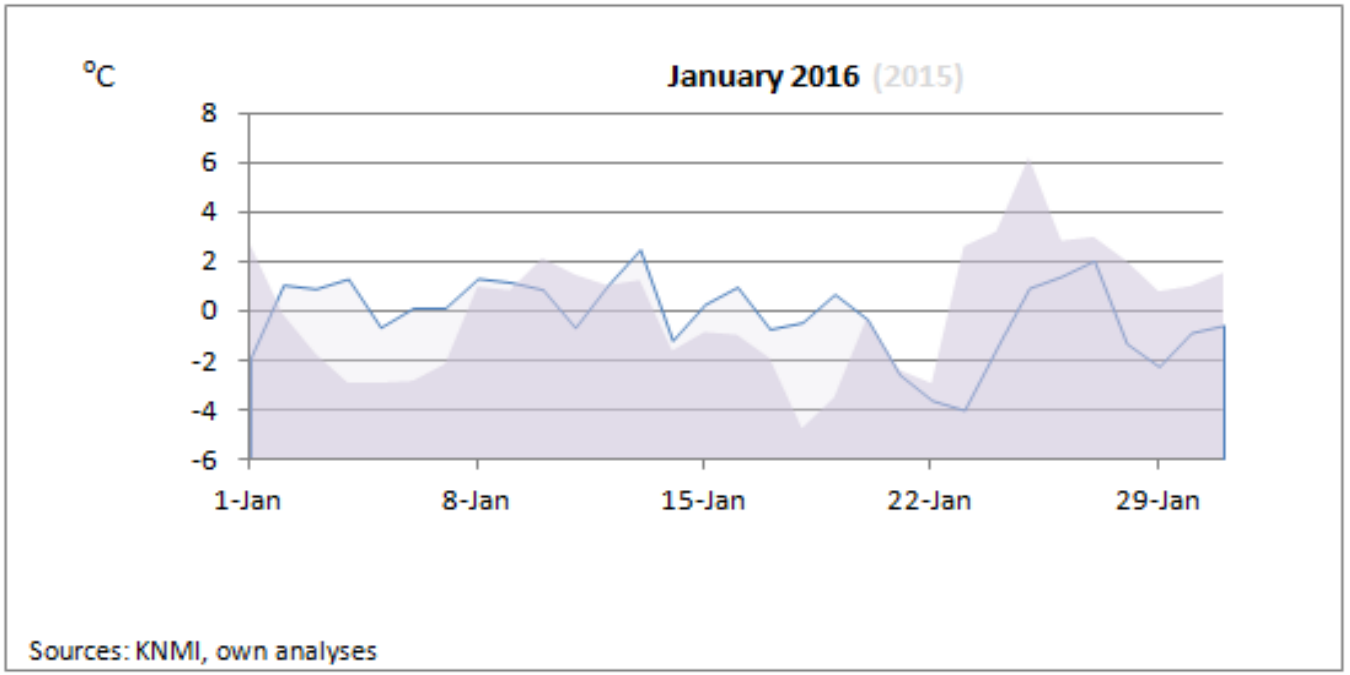


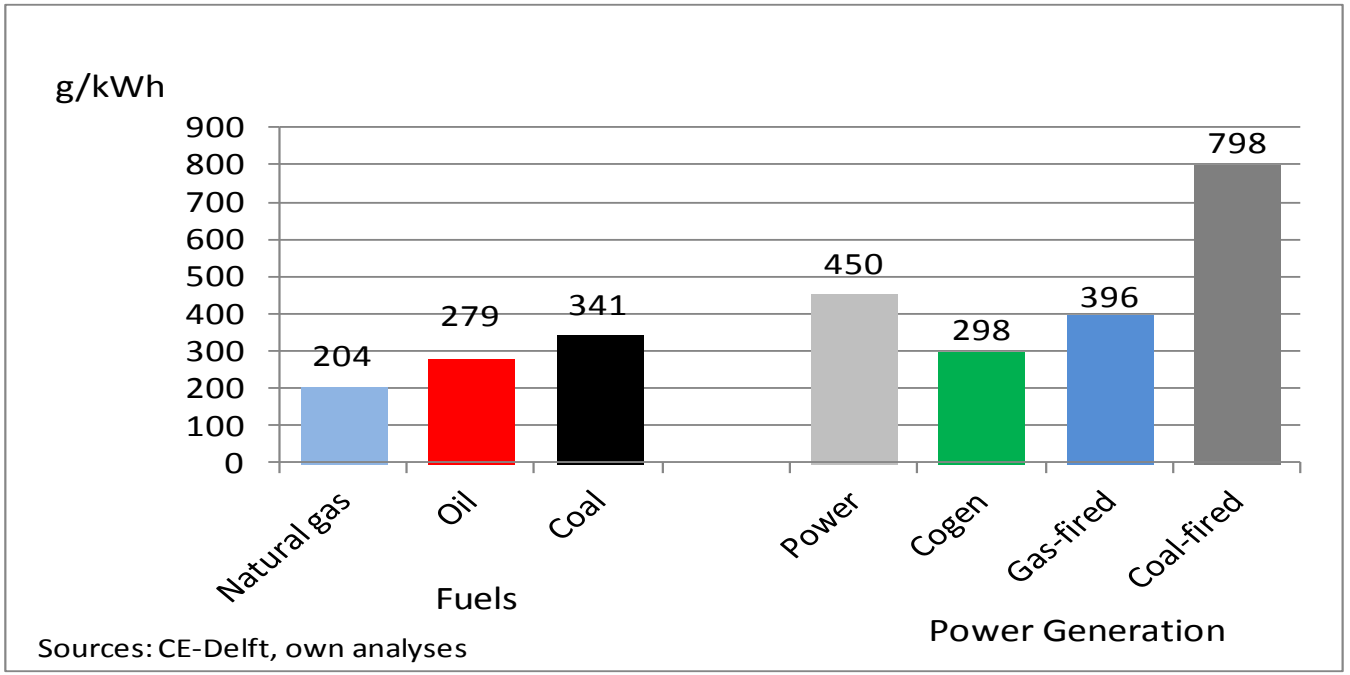
MISCELLANEOUS

Effective Temperature January 2016



In January 2016, the average daily effective temperature (temperature including wind shield factor) was 4.7 °C, much higher than the effective temperature of January 2014 (average 0.7 °C) is presented as well.

Fuel Specific CO2 Emissions



Characteristic CO2 emissions used in this presentation.

Epilogue

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This presentation is based on numerous sources which present data on energy demand and supply in The Netherlands. These data, however, do not cover the entire energy system. Some approximations and scaling factors were thus needed. The author would like to thank students from Hanze University of Applied Science in Groningen and various energy experts in The Netherlands which gave suggestions for improvements of the methods used. Currently, the aggregated results of this work are in good agreement with data supplied by the Dutch National Office of Statistics (CBS). It is believed by the author that the detailed results in this presentation give a fair presentation of the complex reality of the Dutch energy system.

Nevertheless, the author invites readers to comment on the data provided with the objective to further improve this work. After all, good and reliable data are at the heart of any successful policy to make our world more sustainable.